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Materiel Command Creates Materials Advisory Group For Improved Management

Activated awareness of an increasing need for better management in materials research accounts for recent formation of the Materials Advisory Group (MAG) within the U.S. Army Materiel Command (AMC).

Chaired by Norman L. Klein, Chemistry and Materials Branch, Research Division, the Group is composed of key research management representatives from materials research activities.

The Group will advise Headquarters, AMC, on matters of materials research and development policy and

(Continued on page 5)

ASTIA Rounds Out 10 Years Service, Takes Role As Department of Defense Documentation Center

Ten years to the month after the Armed Services Technical Information Agency became fully operational it was redesignated, on Mar 27, the Defense Documentation Center for Scientific and Technical Information.

The change is in line with what has been termed a 3-month period of "more decisions made and more procedures crystallized . . . than in the nearly 20 years since the scientific and technical information problem was recognized during World War II."

Dr. Harold Brown, Director of Defense Research and Engineering (DDRE), spelled out many of the objectives of the redesignation — set forth complete with procedural guidelines in DoD Instruction No. 5100.38. The DDC, as was ASTIA, is under Air Force operational control but under DDRE management.

In its new role the DDC is relieved of certain restrictions that were applied to ASTIA. Notably, it is authorized to receive all DoD scientific and technical documents except Top Secret, cryptographic, registered documents, and special categories of intelligence in which there is little research, development, testing and evaluation information. Contract proposals, administrative reports, orders and memoranda also are excluded.

For example, Restricted Data on nuclear weapons which ASTIA was prohibited from handling may now be accepted by the DDC. Further, the new operational plan is intended to speed up appreciably the procurement of classified documents by contractors having a need-to-know certification.

Expected to increase greatly the

(Continued on page 3)

OCRD Announces New R&D Reserve Procedures

Administrative changes to expedite assignment and termination of Army Reserve Research and Development Training Unit projects have been announced by the Office of the Chief of Research and Development.

Detailed in a letter to each USAR R&D Training Unit commander, the new procedure slashes about 40 percent of the administrative channels, insures that all offices handling actions are properly informed on policies, and defines the functions of directing agencies.

The change should have little effect on the actions of R&D Reserve units because it involves mainly the processing of project requests after they reach OCRD, the letter states.

Units will still forward proposals directly to OCRD. Then the short-cutting begins. Proposals formerly were sent to a technical service, then to a laboratory or other activity where a division or branch was assigned as directing agency, then back up the coordination ladder through

(Continued on page 4)

Featured In This Issue . . .

Army R&D Chief Entertains Quadripartite Group

Members of the Washington Standardization Office (left to right) Maj Gen Roger St. John, United Kingdom, Brigadier John A. W. Bennett, Canada, and Col John H. Howard, Australia, join receiving line at reception held at Fort Myer, Va. Hosts were Lt Gen Dwight E. Beach (third from right) and Mrs. Beach. At right is Maj Gen George W. Power, Deputy Chief of Army R&D, and U.S. Representative to the WSO. (See story on page 12.)

Army R&D Newsmagazine

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Purpose: To improve informal communication among all segments of the Army scientific community and other Government R&D agencies: to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

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Theme of the Month: Transfer of Information

NOTE: The previous issue of this publication announced release of the President's Science Advisory Committee report titled **Science, Government, and Information,** *dealing with responsibilities of the technical community and Government in the transfer of information. The results of a study conducted by a special subpanel headed by Dr. Alvin M. Weinberg, Director of the Oak Ridge (Tenn.) National Laboratory, are considered of vast import to the Army scientific community wrestling with the knotty problem of achieving benefits of more effective use of scientific information. The "Summary and Major Recommendations" of that report follow.*

Transfer of information is an inseparable part of research and development. All those concerned with research and development—individual scientists and engineers, industrial and academic research establishments, technical societies, Government agencies—must accept responsibility for the transfer of information in the same degree and spirit that they accept responsibility for research and development itself.

The later steps in the information transfer process, such as retrieval, are strongly affected by the attitudes and practices of the originators of scientific information. The working scientist must therefore share many of the burdens that have traditionally been carried by the professional documentalist. The technical community generally must devote a larger share than heretofore of its time and resources to the discriminating management of the ever-increasing technical record. Doing less will lead to fragmented and ineffective science and technology.

These are the major findings and recommendations of this Panel. In arriving at these conclusions, the Panel has tried to understand the information transfer process itself, and to identify those problems in information handling that have been magnified by the accelerating growth of science and technology. The first two parts of the following report therefore describe some attributes of the information process and of various information handling systems.

Since strong science and technology is a national necessity, and adequate communication is a prerequisite for strong science and technology, the health of the technical communication system must be a concern of Government. Moreover, since the internal agency information systems overlap with the non-Government systems, the Government must pay attention to the latter as well as to the former.

The Government must be concerned with our non-Government communication systems for another, less obvious reason. The technical literature with its long tradition of self-criticism helps, by its very existence, to maintain the standards, and hence the validity, of science, particularly of basic science. The Government, as the largest supporter of basic science, has a strong interest in keeping viable this mechanism of critical review of the science it supports.

The Government's concern with technical communication is complicated by the impact of modern science and technology on national defense. Criteria for safeguarding information that should not be divulged in the national interest must be established and must be kept up to date. This Panel has not analyzed in detail these difficult problems of secrecy and classification; they may well bear further thought and analysis by another group.

Since both the Government and the technical community are involved with our technical communication system, the Panel, in making detailed recommendations that elaborate upon our general recommendations, has addressed itself both to the technical community and to the Federal agencies.

A. Recommendations to the Technical Community

1. *The technical community must recognize that handling of technical information is a worthy and integral part of science (pp. 14, 27, 29).*

We shall cope with the information explosion, in the long run, only if some scientists and engineers are prepared to commit themselves deeply to the job of sifting, reviewing, and synthesizing information; i.e., to handling information with sophistication and meaning, not merely mechanically. Such scientists must create new science, not just shuffle documents: their activities of reviewing, writing books, criticizing, and synthesizing are as much a part of science as is traditional research. We urge the technical community to accord such individuals the esteem that matches the importance of their jobs and to reward them well for their efforts.

2. *The individual author must accept more responsibility for subsequent retrieval of what is published (pp. 14, 24-26).*

Individual scientists and engineers must participate in the information transfer process, rather than leaving the entire responsibility to the professional

(Continued on page 17)

ASTIA Assumes New Role as Defense Documentation Center

(Continued from page 1)

flow of documents available through the DDC is the requirement that all contractors engaged in DoD activities will submit all important progress documents to the DDC. Subcontractors, and also research enterprises operating under grants, are under the same requirement.

Each DoD component is required to arrange for an orderly transfer to the DDC of all documents and document center functions. However, important is that such agencies holding information will retain the right to release of information to requesters and to certify clearance and need-to-know.

In major respects the DDC will function as a counterpart of the newly established National Referral Center for Science and Technology (NRC), created as a Library of Congress Division but funded by the National Science Foundation. The NRC started limited operations last month and is expected to work closely with the DDC.

As stated in DoD Instruction 5100.38, dated Mar. 19, 1963, the DDC is responsible for "timely dissemination of scientific and technical documents to the DoD community, and effective interchange of unclassified scientific and technical documents with other Government documentation services."

The primary function of the DDC is to acquire, store, announce, retrieve, and provide secondary distribution of scientific and technical documents, and to provide special document and abstract listings upon request. It also is charged with testing, evaluating and applying techniques and equipment for improved distribution of documents.

Under the supervision of the DDRE the Center will maintain a clearing house, in the form of an index, of current DoD-generated research, development, testing and evaluation programs, and provide a centralized directory.

The Instruction states that each DoD component is to establish internal procedures and enforce contractual provisions which require that reproducible copies of documents containing the results of RDT&E efforts are provided to the DDC.

Required also is that the Departments of the Army, Navy, and the Air Force, and the Advanced Research Projects Agency each will appoint a representative to act as liaison with the DDC.

Col James O. Vann of the Air Force, who was commander of ASTIA, continues in the same capacity with the DDC. Similarly, Dr. Charles L. Bernier remains the Director. Walter M. Carlson, Defense Director of Technical Information, who assumed office Jan. 1, 1963, provides management direction to the DDC.

Dr. Bernier told the American Chemical Society at its 144th national meeting in Los Angeles Apr. 1 that the DDC may expect to process three to four times as many documents as were handled by ASTIA, due to the new reporting requirement. The Technical Abstract Bulletin (TAB), now published twice a month and widely distributed, is expected to be "repackaged" to meet the increase in volume.

The DDC, he said, will have the responsibility of coordinating activities of all military documentation centers and maintaining up-to-date information on the subject areas of stored data. DDC will call to DoD attention subject areas in which requests are received for which there are no centers.

The redesignation will not affect plans previously developed by ASTIA to relocate facilities at Cameron Station, Va., in July 1963 to accommodate the additional personnel and equipment necessary to implement the DDC program.

$21 Million Savings Earn Engineer Top Army Award

Design and development of hydroelectric power plants, credited with effecting savings to the Government of approximately $21 million, are recognized in presentation of the Army Exceptional Civilian Service Award to William K. Cave, a veteran of 29 years service with the Corps of Engineers.

Lt Gen W. K. Wilson, Jr., Chief of Engineers, U.S. Army, presented the Army's highest civilian award to the Chief of the Electrical and Mechanical Branch, Civil Works Directorate, at a ceremony in mid-February. Maj Gen W. F. Cassidy, Deputy Chief of Engineers, and Maj Gen R. G. MacDonnell, Director of Civil Works, attended.

The citation, covering exceptional performance of duty during the period from Jan. 1, 1956 to Aug. 1, 1962, stated that Mr. Cave had "demonstrated the highest degree of engineering and technical ability on matters pertaining to electric power and design of hydroelectric power plants, navigation locks and dams."

A graduate of Dalhousie University, Halifax, Nova Scotia, and the Massachusetts Institute of Technology, he is internationally known as an expert on the design of hydroelectric power plants. More than 23 of his 29 years Federal Career Service have been in the Office, Chief of Engineers, Washington, D.C. He has been in his present position since 1944, and in May 1947 received the Department of the Army Meritorious Civilian Service Award.

William K. Cave is congratulated by Lt Gen W. K. Wilson, Jr., Chief of Engineers, after receiving Army Exceptional Civilian Service Award.

Armed Forces Day Events To Stress Power for Peace

The 14th Annual Armed Forces Day, symbolizing the unification and close working relationship of the Services, will be celebrated by the Department of Defense on May 18.

"Power for Peace," the Armed Forces Day slogan for the past decade as symbolic of our national policy, will again be the theme. To provide the American public the opportunity to inspect the preparedness of their military forces, and to permit greater public and military participation, local observances will be scheduled throughout the U.S. and overseas during the period May 11-19.

The Office of the Assistant Secretary of Defense (Public Affairs) is responsible for the policy and direction of worldwide Armed Forces Day activities. Exhibits, exercises, parades, and maneuvers will demonstrate that the U.S. peacetime military forces are at record strength.

OCRD Announces New Reserve R&D Training Unit Procedures

(Continued from page 1)

OCRD to The Adjutant General's Office, and finally to the appropriate Army Corps for assignment of the project to the unit.

Under the new procedure OCRD forwards a proposal to the appropriate agency, then it goes to a subordinate command or activity, and next to that echelon which would become the directing agency for the project and which directly requests the appropriate Army Corps to assign the project to the unit.

Copies of the directing agency's action are then sent to OCRD, the appropriate Army Area Headquarters, and as may be desired to addressees or subordinate echelons.

To avoid delay in assignment of projects due to lack of orientation of potential directing agencies, OCRD now forwards, with each proposal, a copy of procedures agreed upon and other essential information.

Project assignments have a twofold purpose—to develop technical knowledge of participants, and to contribute to the Army R&D mission.

Often termed the "strength in depth" of Army research and development, more than 2,100 participants in the Army Reserve R&D unit program are currently providing a nucleus of trained scientists and engineers (more than 40 percent hold advance degrees) ready for duty in event of a national emergency or of war.

The program provides an organized means to train and develop Reserve scientists and engineers, keeps them abreast of military technological developments within the Army, and utilizes their talents in peacetime to enhance the Army research and development mission. Overall responsibility for the program is vested in Lt Gen Dwight E. Beach, Chief of Research and Development.

Some units, such as the 1131st R&D Unit of Ithaca, N.Y., are associated with universities; others, like the 3369th R&D Unit of Birmingham, Ala., represent a cross section of professional fields. At Redstone, Ala., most of the Reservists of the 3353rd R&D Unit are engaged in rocket and guided missile development.

Only personnel qualified by education and experience to perform professional scientific and engineering work in specified fields are assigned or attached to an Army Reserve R&D unit. Final approval of applicants is determined at Department of the Army level.

Generally, education and experience in the physical, engineering, medical and biological sciences, psychology, and mathematics, are needed.

Procedures for organization of USAR R&D units, qualifications for members and other pertinent information are set forth in AR 140–305.

Members of USAR R&D units maintain an affiliation with the Army Reserve and Active Army by a combination of active-duty and Reserve training. Within the broad guidelines established by OCRD, each unit develops its training programs, including group or individual research tasks. R&D film reports, the *Army R&D Newsmagazine* and other information materials apprise members of current R&D activities.

For example, with expanded Department of the Army participation in National Science Fair activities this year, R&D Reservists are acting as judges and providing counseling or other assistance for high school science fairs.

R&D Reservists do not receive pay for their work on research projects, but are credited with participation in Reserve duty training, normally at a rate of one retirement point credit for a minimum period of two hours in one day.

Results of their work are usually submitted in the form of written reports, sometimes in the form of films or other appropriate format.

A Project Guide is furnished but most ideas for projects originate with unit members. Project assignments are usually related to special group or individual skills in each unit. Work normally produces valuable data. By expanding their knowledge in a specific field, researchers help themselves, possibly their employers, and the Department of the Army.

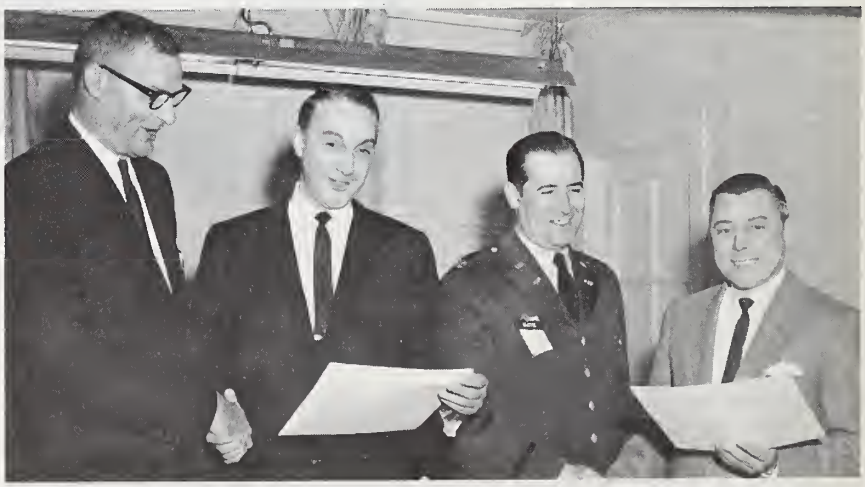
2 Fort Detrick Lab Employees Share $885 Award

The Civilian Employees Incentive Awards Program at the U.S. Army Biological Laboratories, Fort Detrick, Md., has enriched two men by $885.

Charles E. Mumaw, Office of the Director of Procurement and Property, and John J. Curtis, Technical Evaluation Division, shared the initial award (further cash may come from subsequent evaluations at Army echelons) for their suggestion to use molded plastic to replace glass pre-impingers.

The pre-impinger is a device which enables the separation of aerosol particles into two classes, i.e., particles less, or greater, than five microns in diameter. Smaller particles are of primary interest since they are most effective in producing disease in man and animal, and the most dangerous from a public health standpoint.

Developed by the British, the pre-impinger principle has been used for some time in the Biological Laboratories at Fort Detrick and at Dugway Proving Ground, Utah. Usage of the new plastic devices at these installations has resulted in estimated annual savings of $26,772. Intangible benefits include safety, ease of packaging for field use, and simplified storing.



CASH WINNERS Charles E. Mumaw (right) and John J. Curtis (left center) receive congratulations from Dr. W. W. Dorrell, Director of Technical Services, Fort Detrick, and Lt Col H. E. McCue, Procurement Division.

Army Materiel Command Creates Materials Advisory Group

(Continued from page 1)

management. Members, drawn from the management side of materials R&D, consist of: Paul D. Denn, Deputy Chief, Research and Development, U.S. Army Mobility Command, Detroit, Mich.; Dr. J. D. V. Kaufman, Chief Scientist, U.S. Army Munitions Command, Picatinny Arsenal, N.J.;

Dr. S. Benedict Levin, Institute for Exploratory Research, U.S. Army Electronics Command, Fort Monmouth, N.J.; John L. McDaniel, R&D Operations, U.S. Army Missile Command, Redstone Arsenal, Ala.; and Gerald Reinsmith, Chief, Research Division, U.S. Army Weapons Command, Rock Island (Ill.) Arsenal.

Although between 10 and 15 percent of the Army materials effort is expected to continue outside of the AMC complex, coordination of the overall materials R&D activity has been assigned to the AMC.

Observers from agencies outside the AMC with a materials R&D mission will be asked to attend MAG deliberations when items concerning their fields are under consideration. This will serve as one means for accomplishing the requisite coordinaton. The action officer for materials R&D in the Office of the Chief of Research and Development has an observer status for all deliberations.

Cognizant that managers are immobilized without the technical knowledge of bench scientists and engineers to support them, the Group's membership is backed up by eight working groups.

Areas of specialization for these groups and their leaders are: *Design Coupling*, H. A. Heithdecker, R&D Operations, U.S. Army Missile Command, Redstone Arsenal, Ala.; *Metals*, Harold Markus, Chief, Metals Laboratory, Pitman Dunn Laboratories, Frankford Arsenal, Philadelphia, Pa.;

Ceramic, Dr. Bernard Steverding, Chief, Materials Research Laboratory, U.S. Army Missile Command, Redstone Arsenal, Ala.; *Organic*, Jacob Matlock, Chief, Plastics and Packaging Laboratory, Picatinny Arsenal, Dover, N.J.; *Composite*, Fred Schmiedeshof, Chief, Materiels Research and Development, Watervliet Arsenal, Watervliet, N.Y.;

Test and Evaluation, David E. Driscoll, Chief, Test and Evaluation Division, U.S. Army Materials Research Agency, Watertown Arsenal, Watertown, Mass.; *Electronics*, Louis Reiss, Consultant, Electronic Parts and Materials Division, U.S. Army Electronics Command, Fort Monmouth, N.J.; *Applications Research*, Dr. George R. Thomas, Chief, Chemicals and Plastics Division, U.S. Army Natick Laboratories, Natick, Mass.

Activation of the MAG has its source in the recent Army reorganization. Following establishment of the new commands, the Office of the Chief of Research and Development assigned Army-wide coordination of materials activities to the AMC.

Contained in this responsibility was the continuing problem of reducing the lead time between the inception of new materials and their application in engineering design of end items of equipment and hardware.

This problem antedates the existence of the AMC. Concentrated attention had been focused and action taken during the latter part of the tenure of Lt Gen Arthur G. Trudeau as Chief, Research and Development.

The general's concern had been aroused by communications with various research directors in industry, particularly with those at the Republic Steel Corp. Industrial researchers developed advanced unique materials only to find that military contractors confronted with deadlines are reluctant to utilize anything but time-tested alloys, rubber and plastic compositions, graphite ablative parts, etc.

Quantum jump technological advances, possible if engineers can capitalize on both new design ideas and new materials, are halted by hesitancy to delve into the possibilities of the new materials.

To bridge this gap by coupling materials research to advanced design, CRD requested the Chief of Ordnance to activate a group to study the problem and evaluate solutions proposed by the Materials Advisory Board of the Natitonal Academy of Science-National Research Council.

Progress had been made in tank, automotive and allied equipment, and it is continuing under the AMC. A new project for materials application research and technology has been approved and will be funded in FY 1964 at a tentative level of $500,000.

Funding covers development and exploitation of new knowledge resulting from basic and supporting research to provide new and improved materials and processes (fabrication, treatment, and inspection) not identified with specific hardware.

The results of this work are applied by the major subordinate commands and Army-wide laboratories to the design, development and production of specific items.

By establishing the Materials Advisory Group, the AMC seeks further to close the gap between research and application. The MAG's Technical Working Group on Design Coupling will study for immediate application such items as high-strength-to-weight-ratio material proposed by industry.

In the mid-to-long-range planning time frame it is conceivable, a materials leader said, that the weight of Army weapons, equipment and supplies can be cut from ½ to ⅔ of that of the present by new materials.

NATO Officers to Visit U.S. Army Installations

NATO staff officers are scheduled to visit U.S. military installations as part of a series of periodic orientation trips by members of the NATO Military Committee and Standing Group, Apr. 22-26 and May 6-10.

Sponsored by the United States representatives to the Military Committee and Standing Group on behalf of the Secretary of Defense, the 1963 tours of 40 to 50 officers each will include Fort Knox, Ky., Fort Benning, Ga., Fort Rucker, Ala., and Fort Bragg, N.C.

The North Atlantic Treaty Organization (NATO) was established with the signing of the North Atlantic Treaty in Washington, D.C. by 12 countries on Apr. 4, 1949.

The original 12 members are Belgium, Canada, Denmark, France, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, the United Kingdom, and the United States. Greece and Turkey joined the Alliance in February 1962, and the Federal Republic of Germany became NATO's fifteenth member in 1955.

The Standing Group is the executive agency of the Military Committee. As such, it is the body to which the NATO Military Commanders are responsible and, in turn, is the agency primarily responsible for top-level strategic guidance in the entire area of NATO military operations. It consists of representatives of the Chiefs of Staff of the United States, the United Kingdom, and France.

The permanent offices of the Military Committee and the Standing Group are located in the Pentagon, Washington, D.C.

Army Personnel Research Office Automates Peer Ratings

The Army Automatic Rating Machine, a portable electronics device which provides a fast and accurate procedure for peer or "buddy" ratings of personnel, was demonstrated Mar. 22 to Maj Gen Chester W. Clark, Director of Army Research.

Accompanying the general were Lt Col Warren G. Langley, Executive Officer of the U.S. Army Research Office, and Col George J. Bayerle, Jr., Chief, Human Factors and Operational Research Division, OCRD.

The machine was developed by the National Bureau of Standards on the basis of concepts and operational specifications originated by human factors scientists in the U.S. Army Personnel Research Office (USAPRO). Peer ratings, it was stated, have proved of appreciable value in predicting top fighters as well as leaders, although the technique has been used mainly as a research tool.

USAPRO demonstrates Army Automatic Rating Machine to Maj Gen Chester W. Clark, Director of Army Research (right) and Col George J. Bayerle, Chief, Human Factors and Operations Research Division, OCRD (standing, center).

Peer ratings for personnel classification on an Army-wide basis can be achieved now, Col Charles S. Gersoni, USAPRO commander, told General Clark in explaining potentialities of the machine for classification purposes. James P. Nigro, supervisor of the NBS team which engineered the system, briefed the general on its technical aspects.

Even early in basic training, the average estimate of what a group of trainees think about the ability of any individual in the group has a high relationship with the actual later performance of that individual.

Dr. J. E. Uhlaner, Director of USAPRO Research Laboratories, explained that trainees appear to have a fairly good idea as to how their fellows will behave as fighters and leaders by the third week of training. By the fifth week, their consensus predictions have a high degree of accuracy.

A USAPRO research study of men fighting on the Korean front, he said, showed that peer ratings were excellent indicators for what a man not only *can* but *will* do in actual combat. Further evidence of the value of peer ratings was a study in which West Point students picked out their classmates who later turned out to be the best officers in Korea.

The same type of rating is now used as a standard component of the grading system of the Ranger Training Program and for systematic identification of enlisted men to be trained as noncommissioned officers.

Despite their value as predictors, peer ratings have been used operationally on a more limited basis than psychological tests. Because of the burden of clerical processing, it has been difficult to provide data in time for assignment purposes.

The Army Automatic Rating Machine, a prototype of which is now ready for field tryout, cuts down the scoring and recording time for a 15-man squad from 1 hour to 3 minutes, a 95 percent saving in processing time. The entire rating process for a company of men, 20 squads, takes only an hour.

The machine is not only fast; it is accurate. It eliminates the human error factor in recording and totalizing scores and in computing and recording average ratings. A "conservative estimate" is that $11,600 of personnel processing time costs are saved for every 100,000 men rated.

In addition to research in other areas of personnel measurement and utilization, the Army Personnel Research Office has developed many "pencil-and-paper" rating methods.

Included are the ranking type, in which the rater lists individuals in best-to-worst order, and the graphic or categorical grouping type, in which the rater assigns the individuals to one of several descriptive in a maximum-to-minimum arrangement, such as superior, very good, good, average, inferior.

In the graphic type of rating, the rater places as many names in each category as he pleases. In both types of rating, numerical scores are attached to the location of the ranking or the category. The final score of an individual is the average of all the ratings he receives.

The Army Automatic Rating Machine has the capability of using both these types of rating. It can handle four groups of up to 20 men each. Each individual in the group has before him a covered Rating Panel. He swings the cover open and sees an array of sockets and 20 ratee plugs, each 1 and ¾ by ⅝ inches in size. Each plug of a set has associated with it a number and is wired according to this number.

The rater places the plug which bears his own name into the "Own Name" socket. To do rank ordering, the rater places in the sockets of the ranking column the plugs bearing the names of his group mates in the best-to-worst order of his choice. In doing the graphic type of rating, the rater places the plugs in any of seven columns of sockets.

If the rater changes his mind about where he wishes to place a man, he can remove the plug and place it in a more suitable socket. When he is satisfied that the names are arranged as he desires, he closes the panel.

The panels are connected to the rating console, which does the computation. Panels are used in the field

independently of the rating console, and can be connected for computation at any time.

The rating console contains the controls, score displays, and the computing equipment which does addition and division, the two functions needed to compute means. After a group has completed its ratings, the rating console operator checks by pressing a button to find out whether all panels are ready for scoring.

Once the panels are ready, he merely presses another button each time he wants to obtain the score of a given individual. The digital readout is accurate to two decimal places. The display shows the squad number, ratee number, number of raters, and ratee's average score.

The operator then records the average score for each ratee. Even this manual function can be automated, when desired, by plugging in a Flexiwriter for hard copy printout.

The electronics engineering team in the National Bureau of Standards which developed the Army Automatic Rating Machine consisted of D. C. Friedman, J. R. Park, W. D. Urban, and J. P. Nigro as supervisor.

Rudolph Berkhouse of USAPRO was primarily responsible for developing the operational specifications for the rating machine, serving in a liaison capacity with the NBS team.

As Staff Assistant for Plans, Berkhouse will continue in his consultative capacity during the forthcoming field tryout of the rating machine by the USAPRO Behavioral Evaluation Research Laboratory, headed by Dr. Leonard Gordon.

Fort Detrick Hosts Five Talent Search Finalists

Dr. Harold A. Neufeld, Fort Detrick scientist, demonstrates operation of oxygen electrode to junior scientists (left to right, front) Sarah Roberts, Peter Kauffman, Henry Smilowitz; (rear) Ronald Royce, Barry Rosen.

Five of the 40 finalists in the 22nd Annual Science Talent Search held in Washington, D.C., early in March, visited Fort Detrick, Md., and were briefed on research being conducted at the Army Biological Laboratories.

Scientists explained specific aspects of investigations and laboratory techniques and showed some of the latest research equipment.

The Science Talent Search is conducted annually for the Westinghouse Science and Scholarship Awards by Science Clubs of America, and is administered by Science Service, Washington, D.C.

Of the 40 winners this year, 32 ranked in the top five percent of their graduating class and 23 were first, second or third. Most of the winners are members of Science Clubs and many of them are club presidents or hold other offices. Girls accounted for 23.3 percent of the total entries.

The Fort Detrick visitors included Peter Carr Kauffman, 17, of Seattle, Wash., whose 4-month research effort resulted in a method for extracting and measuring Chromium-51 in sea water. He plans to attend Princeton University and major in chemistry and physics.

Sarah C. Roberts, 17, Salem, Ore., was chosen for her project to investigate the composition of a group of compounds known as hydrates. To prepare for a career in teaching biochemistry, Sarah hopes to major in chemistry at Pomona College, Claremont, Calif.

Barry K. Rosen, 17, of Newtonville, Mass., developed for his project a mathematical theory that describes some of the logic used in scientific explanations. He plans to major in mathematics at Harvard or MIT.

Henry M. Smilowitz, 16, of Brooklyn, N.Y., made a comparative study of the ultraviolet photobiology of two varieties of phage for his science project. He hopes to earn a doctorate in biophysics at Reed College, Portland, Ore.

Ronald R. Royce, 17, of Phoenix, Ariz., had a project in electronics. An electron tube, filled with gas such as argon and subjected to certain values of voltage and current, produced a sphere of luminous gas or "fire ball" between its elements, the cathode and anode. Ronald, an Eagle Scout and a member of the Order of the Arrow, plans to attend Stanford University.

Sidney Leopold, Scientific Information Liaison Office, who acted as host to the junior scientists said, "They were greatly impressed by the scientists with whom they talked and amazed by what they saw. Several of them showed an interest in obtaining summer employment here."

Student Thanks AMRA for Summer Job Experience

The U.S. Army Materials Research Agency, Watertown, Mass., offered employment last summer to a few students from nearby universities. The following comments were extracted from a recent unsolicited letter to Dr. James L. Martin, Technical Director, AMRA, from Michael Sheehan, Lowell Technological Institute:

"Let me again thank you for the opportunity of working at AMRA this past summer. I feel that it was the most rewarding experience of my life.

"Perhaps the greatest benefit was the opportunity to work with Dr. Beeuwkes. It was a great thrill to me when he told me that he would like to continue my working for him so that he might be able to complete the set of tables I was working on during the summer.

"When he said this, although we both felt at the time that it would be impossible, I hoped that this was an indication that the work I had done for Dr. Beeuwkes was satisfactory and I had in a small way contributed to the work which he was doing. Seeing the reactor in operation and learning computer programing also added to the valuable experience I gathered.

"At school, we have organized a Nuclear Engineering Society, and I was wondering if I might be able to arrange a tour of the reactor installation at AMRA. Most of the boys have not seen a reactor in operation and it would be a great thrill for them. We are also planning a trip to Rowe, Mass., to see the Yankee Power Reactor.

"I hope that I have been able to convey what working at AMRA has meant to me."

Col George J. Bayerle Lt Col John S. Oppenhimer Maj David A. Beckner

USARO Officers Join MAAGs in Southeast Asia

Reassignments following completion of tours of duty at the U.S. Army Research Office (USARO) will take three officers to Southeast Asia.

Col George J. Bayerle, Jr., Chief, Human Factors and Operations Research Division, in June, will assume the posts of Deputy Chief of Staff and Executive Officer, MAAG, Vietnam.

A graduate of the U.S. Military Academy (1940), the colonel joined USARO in 1959 following two years as Artillery Battalion Commander, STRAC, CONUS.

During World War II he served as an Artillery battery officer and as battalion staff officer and commander. Following the war he served as an assistant professor of military science and tactics at Stanford University, and was on the faculty of the Artillery School, Fort Sill, Okla.

Recent assignments include Division Artillery Operations Officer, 5th Division, Germany, and Chief of Operations, G-3 Section, Hq. Seventh Army, Germany.

LT COL JOHN S. OPPENHIMER, Acting Chief, Research Plans Office, is assigned to G-3 (Operations Division), Joint U.S. MAAG, Thailand. He joined the Office of the Chief of Research and Development in 1960 and was assigned to the Atomic Division.

After receiving his bachelor's degree in mechanical engineering from the University of Virginia, he was commissioned in 1942 and served in Tunisia with the 9th French Zouave Regiment. With the 3rd Infantry Division he was in combat in Italy, France and Germany.

Following combat action in Korea he returned to the United States and served first in Combat Developments, CONARC, and later with the Joint Staff, Alaskan Command, integrating Air Force and Army Air Defenses.

MAJ DAVID A. BECKNER, staff officer, Regional Branch, Environmental Sciences Division, has been assigned to the U.S. Army Element, MAAG, Vietnam, as a Ranger adviser.

He entered the Army in 1950 following graduation from the University of Cincinnati with a B.A. degree in political science. In his junior year at Cincinnati he was elected to Phi Beta Kappa. He also holds an M.A. degree in geography from the University of Oklahoma (1960).

After serving three years in Berlin as Infantry company commander and staff officer, he returned to the U.S. in 1955 as Assistant ROTC Adviser, Infantry School, Fort Benning, Ga. During the latter tour he was awarded the Army Commendation Medal.

Within the U.S. Army Research Office he served as Executive Secretary for the Army Committee on Environment and as staff assistant to the Army member on the DoD Coordinating Committee on Science.

Carter Burgess Joins DIAC

Carter L. Burgess, former Assistant Secretary of Defense for Manpower and currently Chairman of the Board of the American Machine and Foundry Co., has been named on the Defense Industry Advisory Council.

Deputy Secretary of Defense Roswell L. Gilpatric, Chairman of the Council, stated that Mr. Burgess' experience in public service and business would be a source of advice on DoD procurement policies and problems.

Col Bunn, Army Senior Entomologist, Takes ESA Post

Col Ralph W. Bunn

Col Ralph W. Bunn, an honored senior U.S. Army entomologist, assumed the duties of managing editor of the publications of the Entomological Society of America, College Park, Md., following Mar. 31 retirement from military service. Since December 1960 he has been Chief of the Special Projects Branch, Life Sciences Division, U.S. Army Research Office.

The colonel began his scientific career in 1930 following graduation from the University of Kansas. For the next decade he was a research entomologist with the U.S. Department of Agriculture in Utah, Oregon and Louisiana, working on the ecology and biological and chemical control of agricultural pests.

Called to Active Army duty in 1941, he initially directed mosquito control and sanitation at Camp Polk, La. Later he served as Chief of Medical Entomology, 1st Medical General Lab in Texas, England and France.

As Theater Entomologist, European Command, Paris, France, he engaged in training personnel and organizing and supervising the typhus control program in Western Europe. For this he was awarded the Bronze Star.

Following the war he served in a civilian capacity with the Office of the Chief of Engineers, assisting in the organization and supervision of the peacetime pest control program at Army installations.

In 1947 he joined the Regular Army and served as Chief, Medical Entomology Section, Preventive Medicine Division, Office of the Surgeon General in Washington, D.C., and later in Germany. In cooperation with the engineer entomologist he established pest control activities for the Army in Western Europe.

Col Bunn was instrumental in establishing the Armed Forces Pest Control Board which coordinates research and operational phases of DoD programs in entomology and related biology. He served as Executive Secretary and Chairman of the Board prior to his retirement.

Low Altitude Meteorological Research Project Set for Barbados Area

New knowledge of how heat transfer from the ocean to the troposphere, up to 12 miles above the earth, sets in motion energy accountable for tropical hurricanes and weather systems is the goal of a joint project.

Sponsored by the U.S. Army Electronics Command, Meteorology Division, and monitored by the U.S. Army Research Office, the program is being conducted by Florida State University, Esso Research and Engineering Co., and the Woods Hole (Mass.) Oceanographic Institution.

With perhaps a visionary gleam in their eyes, partners in the project anticipate that discovery of new knowledge about tropical weather systems may lead eventually to techniques of modifying the most destructive storms.

Dr. Hoyt Lemons, U.S. Army Research Office (USARO) project manager for the program, said it is based in need for better understanding of tropical meteorology. Related to the studies are a "host of commercial, industrial and agricultural problems."

The project is a part of an Army-wide tropical environmental research program sponsored and monitored by USARO Environmental Sciences.

Led by Professor N. E. LaSeur of Florida State University, the project is being conducted in the Windward Islands of the Caribbean and the Atlantic Ocean to the east of these Islands. Michael Garstang of the University is in charge of operations.

A research vessel, the *Crawford* from Woods Hole Oceanographic Institution, will be stationed about 300 miles east of Barbados, W.I.F., to form a triangular research area of about 66,000 square miles between the ship, Trinidad to the south, and Guadeloupe to the north.

Barbados, site of the 16-inch gun tubes currently being used by McGill University of Canada in Project HARP high-altitude research, is located in the center of the triangular area. (See March issue for first firings of Project HARP.)

Among objectives of the program are to determine the influences of the topography of Barbados upon the atmosphere, and to study the structure and physics of the atmosphere over the ocean not influenced by land effects. The later study will be carried out primarily from the ship.

From detailed measurements of sea surface temperature, humidity of the air in contact with the sea, and from wind velocities, the meteorologists will seek to determine the amount of energy extracted from the sea by the atmosphere.

To measure the energy transported upwards through the layer of atmosphere between the sea surface and cloud base (subcloud layer about 2,00 feet thick), a series of temperature and humidity measuring devices will be suspended by kytoons—a cross between a balloon and a kite—at sea and over Barbados.

Constant-level balloons carrying radar targets will be released to the east of Barbados and flown at predetermined altitudes over the Island. U.S. Army radar spotters at Seawell will track targets to delineate effect of the Island upon the wind field.

The U.S. Army rawinsonde electronic system will be used to determine wind speed and direction, temperature, humidity and pressure to heights up to 120,000 feet to determine how the transfer of energy from the rising pockets of warm air (dry thermals) is carried aloft in the cloud layer and transformed from heat energy into kinetic "energy of motion."

In addition to the financial support supplied by U.S. Army research and development laboratories, almost $500,000 worth of equipment has been granted or is on loan to Florida State University for the research project.

Substantial support is being given by Esso Research and Engineering Co., and by prominent scientists and institutions—for example, Prof. Joanne Malkus of the University of California, Dr. Peter Saunders of Woods Hole Oceanographic Institution and Dr. James Black of Esso Research. Malkus and LaSeur were students of Prof. Herbert Riehl, author of a significant textbook on tropical meteorology and a consultant on the project who had much to do with the planning and design of experiments.

Weather Bureau Aided by Army in Huachuca Studies

The U.S. Weather Bureau, aided by the Army, is now providing electronic engineers with data designed to lead to a better understanding of the effects of terrain on low-level winds.

The Bureau has a staff of 20, headed by Wayne S. Johnson, conducting tests at the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz., with the help of 13 automatic weather stations. The tests concern problems of radio wave propagation and the atmosphere refractive index.

Radar and other electromagnetic waves curve as they pass through air masses of different temperature, pressure, and humidity—just as light waves are refracted or bent when they enter a body of water.

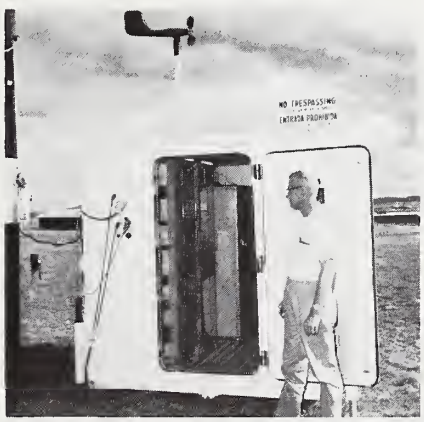
The weather experts consider this effect whenever a new type of electronic equipment is tested at Fort Huachuca's Electromagnetic Environmental Test Facility. The same effect is also noted by the Bureau whenever drone aircraft are being tracked with radar. Quite frequently the radar beams return from their target in curved lines, and errors in fixing the drone's position would occur if the refractive index were ignored.

Data for the refractive index are received by radio from weather instruments carried into the upper atmosphere by free balloons and from the 13 automatic weather stations in and around the test area.

Once each hour, the stations report on temperature, precipitation, humidity, barometric pressure, wind speed and wind direction. This information is supplemented by the findings of a weather radar. Later, the data gathered during test periods are used to evaluate the performance of the equipment.

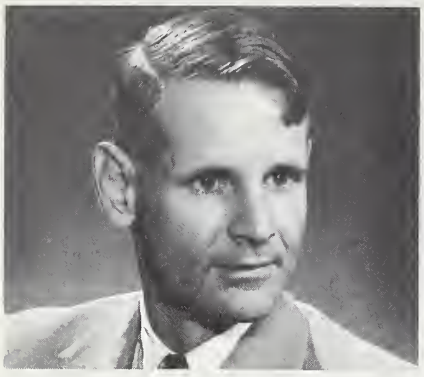
The Bureau also operates a network of 37 stations spaced 1½ miles apart and concentrated on the rangeland between the Huachuca mountains and the San Pedro River. These stations give meteorologists a detailed picture of the weather conditions within a relatively small area.

The U.S. Weather Bureau has been operating at Huachuca since 1959.



Carl Florman, Weather Bureau electronic technician, stands at automatic weather station at Sonoita, one of 13 in Arizona which the Bureau uses to gather atmosphere information for forecasting, research, documentation.

Dr. Marcuvitz Succeeds Dr. Weyl as Assistant Director of Research, DDRE



Dr. F. J. Weyl

Dr. Nathan Marcuvitz

Dr. Nathan Marcuvitz, former Vice President for Research, Polytechnic Institute of Brookyln, is the newly appointed Assistant Director of Research, Office of the Director of Defense Research and Engineering.

Effective Feb. 21, his appointment followed that of Dr. Ernst Weber, President of the Institute, who on Jan. 31 was named Chairman of the Advisory Council of the U.S. Army Junior Science and Humanities Program.

Dr. Marcuvitz succeeds Dr. F. J. Weyl, who served for six months while on loan from the Office of Naval Research where he is Deputy Chief and Chief Scientist.

After receiving a degree in electrical engineering from the Polytechnic Institute of Brooklyn in 1935, Dr. Marcuvitz worked a year as a graduate fellow under Dr. Weber before joining the Radio Corp. of America. As a student engineer he worked on development of electron tubes, iconoscopes and orthicons for television applications. In 1940 he returned to the Polytechnic Institute of Brooklyn and won a master's degree in 1941.

During World War II he was a Research Associate on microwaves at the Radiation Laboratory, Massachusetts Institute of Technology. When the war ended he returned to the Polytechnic Institute as an assistant professor of electrical engineering. Awarded his doctorate in 1947, he was named associate professor (1950) and professor (1953).

In 1957 he was appointed Director of the Microwave Research Institute, a post he held until his appointment to Vice President for Research in 1961. That year he also was appointed Acting Dean of the newly established Polytechnic Institute Graduate Center.

His numerous publications include the *Waveguide Handbook*, Vol. 10 of the M.I.T. Radiation Laboratory Series. He is a Fellow of the Institute of Radio Engineers and a member of the American Physical Society, Tau Beta Pi, Eta Kappa Nu, and Sigma Xi.

DR. WEYL came to the United States in 1933 with his father, Prof. Herman Weyl, the internationally known mathematician who resigned his professorship at the University of Gottingen in protest against the Nazi government.

Dr. Weyl attended Swarthmore College, graduating in 1935 with highest honors. He did his graduate work at Princeton, where he received his Ph. D. in 1939, and then taught at the University of Maryland and Indiana University.

In World War II, he was employed by the Navy Department's Bureau of Ordnance in the Research Group on High Explosives. Later he participated in the first atomic bomb tests at Bikini.

Following his father's interest in mathematics, Dr. Weyl joined the Office of Naval Research in 1947 as a member of the Mathematics Branch and established a contract program in applied mathematics.

In 1953 he conducted a survey of research and training in applied mathematics in the United States for the National Research Council. The report of this survey, completed in 1954, was published by the Society for Industrial and Applied Mathematics in 1956.

Dr. Weyl is President of the Society for Industrial and Applied Mathematics, and is a member of numerous other technical societies. Among his publications are *Analysis of Optical Methods,* and *Physical Measurements in Gas Dynamics and Combustion.*

NSF Reports on Federal Scientific Activities

A 600-page report, *Federal Organization for Scientific Activities, 1962,* was released Mar. 27 by the National Science Foundation.

Labeled the most comprehensive record of Government scientific organization since a similar report was published in 1956, the new edition is nearly doubled in size, reflecting both expanded coverage and the growth of Federal scientific support.

The report shows that from a comparatively small-scale, loosely knit effort prior to World War II, the Federal scientific program has become large, highly organized, and elaborately interrelated. This development has been characterized by:

- An increased attempt to review and coordinate more effectively Federal scientific and technical programs at the Presidential level.
- Appointment of science administrators to Secretary-level posts.
- Integration or coordination of scientific activities within the subdivisions of the agencies.
- Expansion of international science activities.
- Growth of Government-supported extramural programs.
- Emergence of the aerospace programs.

Based on data obtained from the 40 Federal agencies involved in scientific activities, the report presents information on their organization and program content for science.

The report on each Government unit covers scientific research and development, extramural training in science, scientific and technical information, scientific data collection, and scientific testing and standardization.

Descriptions of advisory and coordinating mechanisms, field stations and installations, and federally supported research centers are included.

In addition to the major research and research-supporting agencies such as the Department of Health, Education, and Welfare, the Atomic Energy Commission, and the Department of Defense, the report discusses the many other agencies that carry out or support research and development or other scientific activities. These include the Tennessee Valley Authority, the Interstate Commerce Commission, and many others.

Copies of *Federal Organization for Scientific Activities, 1962* (NSF 62-37) may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for $3.50 a copy.

ARO-D Hosts Army Operations Research Symposium

An Army Operations Research Symposium Mar. 26-27 at Duke University, sponsored by the U.S. Army Research Office-Durham, N.C., gave top-ranking U.S. and foreign experts an opportunity to sound off to about 200 conferees.

The Symposium, a sequel to an introductory conference held at Durham in 1962, included presentation of tech papers and invited addresses by speakers representing the Department of Defense, the U.S. Army, the New York Port Authority, the Operations Research Society of America, and universities active in the operations research field.

A special feature was the presentation of speakers representing operations research interests of the Norwegian Defense Research Establishment, the French Navy General Staff, the Canadian Army Operations Research Establishment, the Ministry of Defense of Federal German Republic, and the Army Operational Research Establishment, United Kingdom.

The list of invited speakers included Lt Gen Dwight E. Beach, Army Chief of Research and Development; the Honorable Charles J. Hitch, Assistant Secretary of Defense (Comptroller); Dr. Leslie C. Edie of the New York Port Authority; Lt Gen Frank S. Besson, Jr., Commanding General of the U.S. Army Materiel Command; and Maj Gen T. H. Lipscomb, Deputy C.G., U.S. Army Combat Development Command.

Symposium panel titles and moderators were: The Organization of an Operations Research Group for Military Service, Dr. Philip M. Morse of Massachusetts Institute of Technology, and The Application of Simulation Techniques to Tactical and Logistic Problems, Dr. Merrill M. Flood, University of Michigan. Special sessions were chaired by Dr. Herbert P. Galliher, Massachusetts Institute of Technology, Col S. J. Weidenkopf, Office of the Surgeon General, U.S. Army; Col L. D. Brumitt, Office of the Chief of Research and Development; Col George F. Leist, Army Materiel Command; Dr. Francis J. Murray, Army Research Office-Durham (ARO-D); Oscar Wells, U.S. Army Weapons Command;

Col Granville A. Sharpe, U.S. Army Institute of Advanced Study; Col Albert R. Hoffman, U.S. Army Logistics Management Center; Col Nils M. Bengston and Lt Col Leslie G. Callahan, Jr., AROD; Col Gordon E. Sayre, Office of the Deputy Chief of Staff for Military Operations; Dr. George E. Nicholson, University of North Carolina; and Andrew G. Favret, Office, Assistant Chief of Staff for Intelligence.

Director of Army Research Maj Gen C. W. Clark presided at a dinner meeting featured by an address by Assistant Secretary of the Army (Financial Management) Edmund T. Pratt, Jr., who was sworn in to his new job only four days earlier. He substituted for ASA (R&D) Dr. Finn J. Larsen, who was called to Europe on business, in speaking on "Challenges in Army Operations Research."

Dr. Hugh Miser, President of the Operations Research Society of America, spoke at a second dinner meeting on "The Environment for Effective Operations and Systems Research."

Inter-American Defense College Graduates 29

Representing 15 of the 20 member Republics of the Organization of American States, 29 officers comprised the first class to be graduated Mar. 20 by the Inter-American Defense College, Fort Lesley J. McNair, Washington, D.C.

Vice President Lyndon B. Johnson, after presenting diplomas to the senior officers, called Cuba a Communist "showcase of failure" which dramatizes the need for success of the Alliance for Progress. The Alliance, he said, has the same purpose as the College, namely, to stress economic, political factors as well as military training.

Under direction of Maj Gen Thomas F. Van Natta, USA (to be succeeded in May by Maj Gen Roland H. del Mar, USA), the Inter-American Defense College is an advanced studies institute for OAS officers.

Conceived by the Inter-American Defense Board which meets in Washington, D.C., the College opened last October for its first 6-month course. Lt Gen Arthur G. Trudeau (USA, Ret.) former Army Chief of Research and Development, was one of the first (1956) and strongest proponents of a "College of the Americas" to strengthen the bond of U.S.-Latin America relations.

He also is credited with pioneering the effort which led to establishment, in August 1962, of a U.S. Regional Science Office in Latin America. Located in Rio de Janeiro, Brazil, it has an Army element which coordinates the Department of Defense science interests.

Officers from different American Republics have an opportunity to study the Inter-American System and the military, economic, political and social factors that constitute essential components of Inter-American defense. The college faculty consists of selected senior military officers from the American republic nations.

Majors Belnap, Thompson Added to OCRD Staff

Recent additions to the staff of the Office of the Chief of Research and Development include Maj Gen Glen D. Belnap, assigned to the Programs and Budget Division, and Maj John W. Thompson, assigned as Assistant Secretary, Army Scientific Advisory Panel.

Maj Belnap holds a B.S. degree in education from the University of Georgia and an M.S. in the same field from Lehigh University. Since 1959 he has served at Lehigh as assistant professor of military science.

During World War II he served with intelligence units in the Army Air Corps. Other assignments have taken him to Germany as a company commander, to Korea as Battle Group S-3, G-3 Section (Atomics), and to the Infantry School, Fort Benning, Ga., where he served on the staff and faculty.

Maj Thompson holds a bachelor's degree in education from the University of Omaha. He comes to OCRD from a 3-year assignment at the Command and General Staff College, Fort Leavenworth, Kans., where he completed the course and served on the faculty and staff. He also has been ROTC instructor at Davidson College, N.C.

Maj Glen D. Belnap

Maj John W. Thompson

Army Radio Transmitter Pioneer Closes 34 Years of Government Service

Robert H. Noyes, who designed and developed the first successful radar transmitter used by the U.S. Army, retired Mar. 29 from the U.S. Army Electronics Research and Development Laboratory after 34 years of Federal service.

Mr. and Mrs. Noyes were honored by civilian and military friends at a retirement dinner and dance Apr. 4 at Fort Monmouth, N.J., where he spent most of his Federal career. For the past 2½ years he had served as Director of Division "S" of the Institute for Exploratory Research.

In 1929 he entered Government service as a junior physicist at the Naval Research Laboratory, Washington, D.C. The following year he went to the U.S. Army Signal Corps Aircraft Radio Laboratory at Wright Field, Ohio (now Wright-Patterson Air Force Base). There he took part in developing the first feasible radio compass for the Army Air Corps.

In 1936 he joined the staff of what was then the U.S. Army Signal Corps Laboratories at Fort Monmouth. During the years preceding entry of the United States into World War II he developed the radar transmitter—a major contribution to the radio-wave reflection system that played an important role in military combat communications.

Robert H. Noyes

The Signal Laboratory's Product Engineering Section which later became the U.S. Army Materiel Support Agency, was organized under his direction in 1940. He also organized the Standards Unit which became the Armed Services Electro-Standards Agency, recently moved to Dayton, Ohio. Establishment of the Instructional Literature Unit, which expanded into the Signal Corps Publications Agency and is now part of the Electronics Materiel Support Agency, is also credited to him.

Commissioned a major in the Signal Corps in July 1942 he served on active duty until July 1946. Assignments included executive officer of the Coles and Squier (Signal) Laboratories in the Fort Monmouth area, Signal Corps liaison officer to the Corps of Engineers, Fort Belvoir, Va., and Chief of the Communications Branch in the Office of the Chief Signal Officer at the Pentagon.

Prior to becoming a division director in the Institute for Exploratory Research, he served as Chief of the Suppression and General Engineering Branch, Director of the Avionics Division, and Chief of the Planning Branch, Office of Technical Plans.

Born in Orome, Me., he was graduated from the University of Maine in 1926 with a B.S. degree in electrical engineering. He has done graduate work in physics at Harvard University, and in advanced mathematics at George Washington, and Rutgers.

Army R&D Chief Entertains Quadripartite Group

Chief of Research and Development Lt Gen and Mrs. Dwight E. Beach entertained about 200 high-ranking Department of Defense and foreign officials at the recent ABCA Army Standardization Program annual reception at Fort Myer, Va.

General Beach is responsible for U.S. Army participation in the American - British - Canadian - Australian effort to standardize Army materiel and equipment. Deputy CRD Maj Gen George W. Power represents him at ABCA meetings.

The reception marked the 15th year of cooperation among the American, British and Canadian armies in materiel research and development. Australia was admitted to the program as a full member in February 1963, following establishment of an Army R&D office in Australia in the fall of 1962.

Recognition of the high degree of scientific competence in Australia and the recommendation for establishment of a U.S. Army R&D Office (now located in Canberra), followed a visit in 1961 of a Department of Defense team surveying the Far East.

Initiated in 1947, the Standardization Program has been designed to improve allied combat readiness by establishing common doctrine, items and actions. The 4-nation cooperation emphasizes mutual interests in research and development and in technical and operational procedural improvements. The group consists of high-ranking officers of the four armies on duty in Washington who are responsible for the overall direction of the ABCA Program.

None of the ABCA armies is legally compelled to agree to a standard or to join in collaboration and coordination leading to a possible standard. Once an army has approved a standard, however, it is morally obligated to conform unless released by agreement of the other armies, or unless the standard item is replaced by a new development.

The broad aim of standardization is to ensure that there will be no operational, materiel or technical obstacles to full cooperation among the American, British, Canadian ad Australian armies to achieve the greatest benefits at lowest practicable cost.

Standardization of both materiel and nonmateriel items requires agreement on the need for standardization and application of the principle of reciprocity. The reciprocity concept extends to funding and to the exchange of personnel, materiel, information, visits and facilities.

The principle covers, for example, the loan of equipment by one army to another for test and evaluation, on a nonreimbursable basis, even though materiel loaned may be destroyed.

Perhaps the keystone of the ABCA Program is the principle that a full exchange of information and opinion among the armies is effected with a minimum of formal procedure. Within the limits of national policies, information on the status of all development projects, current doctrine and tactical concepts is available.

In addition to General Power, other members making up ABCA are: *British*—Maj Gen Roger St. John, Military Attache and Commander, British Army Staff, Washington; *Canada*—Brig John A. W. Bennett, Military Attache and Commander, Canadian Army Staff in Washington; *Australia* — Col John H. Howard, Military Attache.

3 Services Cosponsor Optical Maser Parley

A theme of broad Army interest, "The Physics and Technology of the Optical Maser," is to be discussed at an international symposium arranged by the Polytechnic Institute of Brooklyn at the Waldorf-Astoria Hotel, New York City, Apr. 16-18.

Thirteenth in a series conducted by the Institute, the symposium is sponsored by the U.S. Army Research Office, the Air Force Office of Scientific Research, and the Office of Naval Research.

The symposium will seek to achieve a comprehensive integration of the physics and technology bearing directly on the discovery, theory, and application of maser phenomena at optical and infrared frequencies.

Dr. Robert B. Watson, Chief, Physics and Engineering Branch, Physical Sciences Division, U.S. Army Research Office, will serve as chairman of the Apr. 18 session dealing with "Systems and Applications." Dr. Watson is author of an article titled "Research Spurred on Masers, Lasers, Irasers" in the April 1961 issue of the *Newsmagazine*.

A review of the present state of research will be presented by outstanding authorities in the optical maser field at the opening session. At the five sessions devoted to specialized research, investigators from university, industrial and Government laboratories throughout the world will present some 40 papers on the most significant current advances in quantum electronics, optical maser configurations, materials, newer systems and applications.

The precedent set at the 1952 symposium of providing not only a review of research, but also a forum for discussion of major problem areas and findings of interest to engineers, chemists and physicists involved in advanced research and development, will be continued.

The symposium has been organized by the P.I.B. Departments of Chemistry, Electrical Engineering, and Electrophysics, with the cooperation of the Microwave Research Institute of the Polytechnic, Institute of Electrical and Electronic Engineering, and the Optical Society of America.

Jerome Fox is Symposium Committee Secretary. Abstracts of all papers, a more detailed program, and registration forms are available from: Symposium Committee, Polytechnic Institute of Brooklyn, Microwave Research Institute, 55 Johnson Street, Brooklyn 1, N.Y.

Reassignments Announced For 2 Engineer Officers

Brig Gen George H. Walker will assume the duties of Director of Topography and Military Engineering, Office of the Chief of Engineers, on May 1, succeeding Brig Gen John D. Cole.

Brig Gen Raymond J. Harvey, currently on assignment in Korea, will return to the U.S. early in June to fill the post vacated by General Walker, Assistant Commandant, U.S. Army Engineer School, Fort Belvoir, Va.

A 1937 graduate of the U.S. Military Academy, General Walker holds a master's degree from the University of California. During World War II he served in the Southwest Pacific as Executive Officer, 46th Engineer General Service Regiment, and in the European Theater as commander of the 103rd Engineer Combat Group, Third Army.

Recent assignments include serving as a staff officer on the War Department General Staff; Executive Engineer and Engineer Director, San Francisco District; Executive and Deputy to the Chief of Engineers for Civil Works; Engineer I Corps, Korea.

Prior to his present assignment General Harvey served as a member of the faculty of the Industrial College of the Armed Forces, Fort Leslie J. McNair, Washington, D.C.

A graduate of the U.S. Military Academy, he earned an M.S. degree in civil engineering from the Massachusetts Institute of Technology. Assigned to the Pacific Theater of Operations during World War II, he commanded the 863rd Engineer Aviation Battalion and the 116th Engineer Combat Battalion, 41st Infantry Div.

Recent tours of duty include engineer staff assignments in the Office of the Chief of Engineers in the U.S. and in Germany and Greece.

Brig Gen George H. Walker

Brig Gen Raymond J. Harvey

Army Medics Participating In ICND Nutrition Survey

Two members of the U.S. Army Medical Research and Nutrition Laboratory staff will take prominent roles in an Interdepartmental Committee for National Defense (ICND) nutrition survey this spring in Brazil.

Composed of personnel from universities and Federal agencies throughout the Nation, the survey team will operate as part of the Alliance for Progress program.

Organized into a clinical group, a laboratory group, a dietary group, and a food and agricultural specialist group, the team will cooperate with a number of host country personnel in training and mutual assistance studies.

Capt George E. Bunce, Chemistry Division, U.S. Army Medical Research and Nutrition Laboratory, will serve as laboratory director of the team and Leroy Matoush, Bioenergetics Division, as a nutritionist.

Capt Bunce is a graduate of the Virginia Polytechnic Institute and obtained his Ph. D. in biochemistry from the University of Wisconsin. He participated as a biochemist in a previous ICND survey of the Union of Burma in the fall of 1961.

Leroy Matoush, a graduate of the University of Denver with a B.S. in chemistry, has had considerable experience with dietary surveys of U.S. military posts.

ICRPG Approved by DoD Instruction 5030.24

Establishment of the Interagency Chemical Rocket Propulsion Group (ICRPG) is approved by DoD Instruction 5030.24 issued recently by the Director of Defense Research and Engineering.

The ICRPG is an interdepartmental committee jointly sponsored by the Department of the Army, Navy and Air Force, the Advanced Research Projects Agency and the National Aeronautics and Space Administration. Its purpose is to integrate research and development technical information and program coordination data exchange activities in the field of chemical rocket propulsion.

Chemical rocket propulsion, for purposes of the ICRPG, is defined as encompassing energy derivable from the heat release of chemical reactions and the processes required for conversion of this thermal energy into propulsive power by technology.

More specifically, the ICRPG will concern itself with exchange of information on program administration and technical problem areas in the broad interagency materials program. Included are research, development, test and evaluation of solid and liquid propellant chemicals and the related hardware component parts and materials required in the development of primary rocket power plants.

Activities, some of which date back to World War II and the then active Joint Army-Navy Solid Propellant Group, have been carried out on an informal basis by the various participating interagency groups for a number of years.

Establishment of the ICRPG consolidates, formalizes and makes official the activities of these groups. The change is expected to improve effectiveness of program coordination and technical information exchange.

The ICRPG is composed of a Steering Committee, a Solid Propulsion Sub-Group, a Liquid Propulsion Sub-Group, and several specialized Working Groups in areas such as thermochemistry and analytical chemistry.

The Steering Committee is responsible for the overall activities of the ICRPG and is composed of one member from each of the participating agencies. The members are J. A. Chalmers, Army; Irving Silver, Navy; Allan Eaffy, Air Force, current chairman; Dr. G. V. Mock, Advanced Research Project Agency; Oscar Bessio, National Aeronautics and Space Agency; and W. E. Sheehan (ex-Officio) Department of Defense, ODD-R&E Office of Chemical Technology.

The Solid and Liquid Propulsion Sub-Groups are responsible, under the overall general guidance of the Steering Committee, for planning of the annual meetings and operation of the Working Groups in their respective areas of effort.

The Working Groups operate in highly specialized areas and were set up to apply abilities of experts and specialists on specific problems in chemical propulsion. Seven Groups operate in the areas of Analytical Chemistry, Combustion Instability, Design Automation, Mechanical Behavior, Static Testing, Test Methods and Thermochemistry.

The recent consolidation of the old Solid (SPIA) and Liquid (LPIA) information agencies into the new Chemical Propulsion Information Agency (CPIA) is an outgrowth of the consolidation of other activities in chemical propulsion under ICRPG.

The CPIA is operated under Navy contract by the Applied Physics Laboratory of Johns Hopkins University. It is currently funded on a prorated basis, as were its predecessors, the SPIA and LPIA, by the five participating agencies in ICRPG.

Secretary Vance Announces Actions on Three Generals

Secretary of the Army Cyrus R. Vance has announced extension of the appointment of Lt Gen Leonard D. Heaton as The Surgeon General, U.S. Army, for two more years, until June 1, 1965.

New assignments announced were:

Brig Gen Raymond J. Harvey, Engineer, Eighth U.S. Army, Korea, to the U.S. Army Engineer School, Fort Belvoir, Va., effective in June.

Brig Gen Milburn N. Huston, Assistant Chief of Staff, G-3, Eighth U.S. Army, Korea, to the U.S. Army Training Center, Fort Leonard Wood, Mo., effective in August.

Shillelagh Action

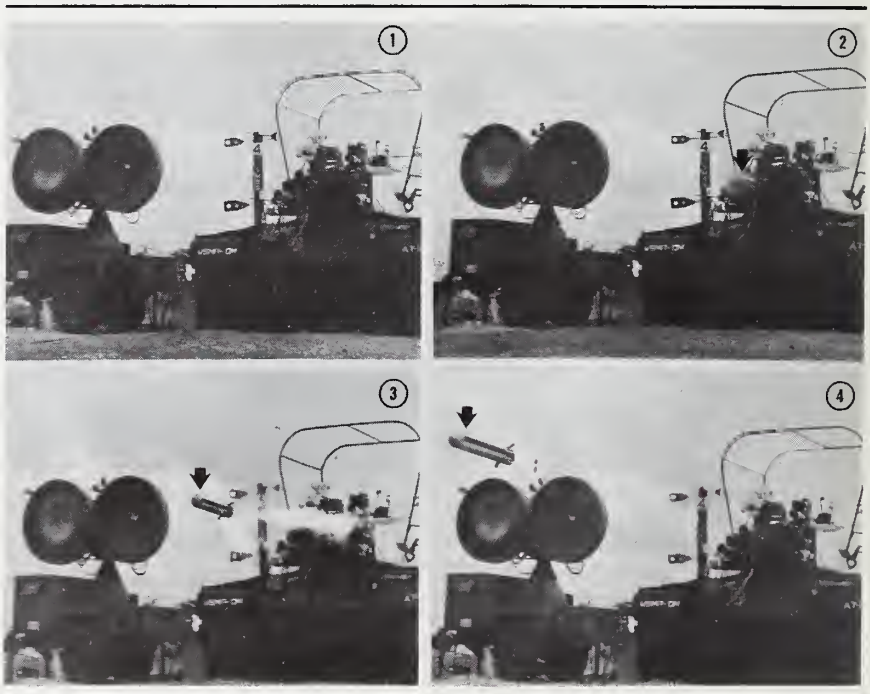
First action photos of the Shillelagh, surface-to-surface, tank-mounted weapon system now in development for the Army, taken during recent tests at an Army missile range, were released Mar. 25.

Arrows pinpoint the guided missile as it streaks from the tank to a distant target in firing tests against both stationary and moving targets.

The Shillelagh, designed as a high accuracy system, recently completed a series of successful tests under different environmental conditions at White Sands Missile Range, N. Mex., and in northern Alaska.

The Army Missile Command at Redstone Arsenal, Ala., is responsible for development of the missile system and the Army Mobility Command, Detroit, Mich., for vehicle development.

Ford Motor Co., Aeronutronic Division, Newport Beach, Calif., is prime contractor for the Shillelagh.



Floating Laboratory Tracks Missile Nosecones for ARPA's Project DAMP

An Army Missile Command officer is the only military man aboard a unique ship that travels the oceans looking for the closest thing in the world to shooting stars.

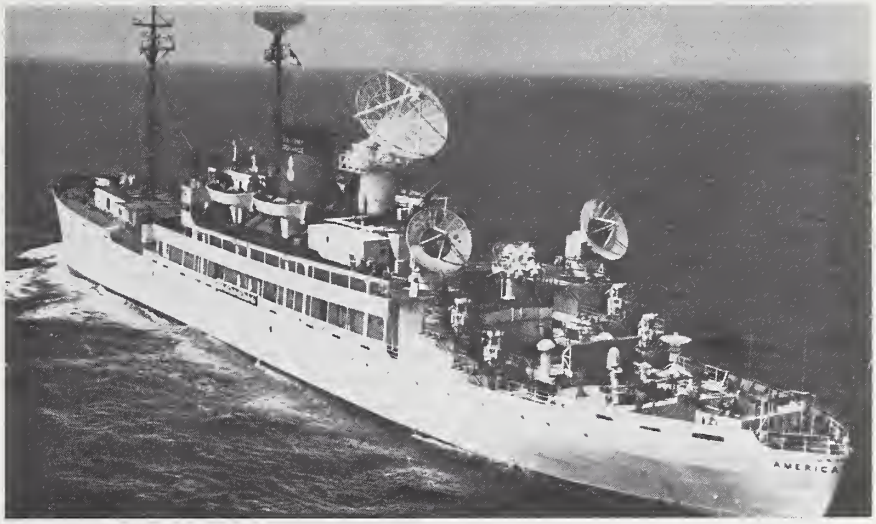
Maj Henry Magill of Redstone Arsenal, Ala., is the Missile Command Project Officer aboard the *U.S.A.S. American Mariner*. The ship studies missile nosecones as they reenter the earth's atmosphere. It had a hand in the recovery of Astronaut Wally Schirra's space capsule which it tracked to impact in the Pacific.

The *Mariner's* job is to see what a nosecone really "looks like," scientifically speaking. Data on such things as its radar cross section, glowing wake, and speed are recorded on film and magnetic tape and sent to analysis centers.

Among other things, this information has application in work to discriminate between ICBM warheads and harmless decoys that might be launched as a "smoke screen" for an attacking missile.

The *Mariner* is a floating laboratory. Its topside is clustered with radars, optical tracking devices and telemetry equipment. Below its decks are such things as instrument calibration laboratories, data recording gear and a precision machine shop.

The *Mariner*, Maj Magill said, has been within eight miles of the splash of a nosecone and men aboard could see the geyser of water as it plunged into the ocean. Differences in materials and configurations cause each type missile nosecone to leave its own flaming "fingerprint."



Refitted Liberty ship, U.S.A.S. MARINER, maneuvers in Project DAMP.

The *Mariner*, part of the Downrange Antimissile Measurement Program (DAMP), is the most completely equipped measurement vessel in the Free World for observing and recording ballistic missile flight.

Managed by the Army Missile Command for the Department of Defense's Advanced Research Projects Agency (ARPA), DAMP is a part of ARPA's Project Defender. The Radio Corp. of America is the prime contractor for the *Mariner* and Barnes Engineering Co. provides the optical tracking equipment.

A 34-year-old engineer, who has been on the *Mariner* just over a year, Maj Magill calls the job "unique, interesting and educational." The *Mariner* is a ship of many ports. Its average time at sea is 45 days. Its home berth is Port Canaveral, Fla.

Life aboard the *Mariner* is good, he said. Nearly every member of the scientific party is a highly trained specialist in his field and many of them have been with the refitted Liberty ship since it was launched in its new role in early 1959. Captain of the *Mariner* is Phillip G. Beck, a retired Navy captain who has been at sea for 50 years.

Fred Ise, a native of Estonia and "a whiz at electronics" is the instrumentation manager. Rein Ise, a brother of Fred, works at the Marshall Space Flight Center.

"The first thing nearly everybody does when he comes aboard," Maj Magill said, "is grow a beard and get it out of his system. From then on everyone goes clean shaven."

Recreation on the *Mariner* means trap shooting off the stern, fishing, movies, and a hi-fi lounge. The vessel also boasts one of the wackiest putting greens that ever frustrated a duffer. The green is built on a hatch cover and whether the green is "fast" or "slow" depends on which way the *Mariner* is rolling at the moment.

Sergeant to Replace USAREUR Corporal Units

The Sergeant solid-fuel, medium-range missile system will be deployed to units of the U.S. Army, Europe, in a phased program commencing this spring, the Department of Defense has announced.

The first U.S. Army Sergeant battalion, which arrived in Europe late in March, will be followed by additional battalions to replace USAREUR Corporal units during coming months.

The liquid-fueled Corporal has been operational in USAREUR for the past six years. As a part of its modernization program the U.S. Army is replacing the Corporal in its NATO-committed units with the more effective Sergeant.

Both missiles are capable of carrying nuclear warheads. The Sergeant, a less complex system which can be fired from mobile launchers, has a solid-propellant motor which shortens its firing preparation time and requires less manpower and maintenance equipment than the Corporal.

Col J. Mort Loomis, Jr., is Sergeant project manager. The U.S. Army Missile Command at Redstone Arsenal, Ala., has technical supervision of the missile system. Sperry-Utah Co., Salt Lake City, Utah, is prime contractor.

West Germany's first Sergeant missile battalion has been training during recent months at Fort Sill, Okla., and White Sands (N. Mex.) Missile Range.

Three Sergeant missile firings conducted in March on the Pacific Missile Range were the first conducted at sea level and were part of extensive testing at White Sands Missile Range.

Army Information School to Move

The Deprtment of the Army has announced plans to inactivate Fort Slocum, New Rochelle, N.Y., by the first of January 1966.

Present functions of the U.S. Army Information School now located at Fort Slocum will be moved to Fort Benjamin Harrison, Indianapolis, Ind., where annual savings of over $1 million in its operation are anticipated.

Army Contracts Exceed $200 Million

Awards of contracts totaling more than $200 million for development and procurement of military materiel were announced in March by the Department of the Army.

The largest two contracts, aggregating $92,654,504, were awarded to the FMC Corp., San Jose, Calif. They call for production of M113 personnel carriers and XM106 mortar carriers.

For production of 1,295 armored reconnaissance vehicles, Cadillac Motor Car Division, GMC, Cleveland, Ohio, received a $25,789,925 contract.

A $5,699,052 contract let to Saco-Lowell Shops, Boston, Mass., is for 13,177 M60 machineguns. Day & Zimmerman, Inc., Philadelphia, Pa., received a $4,457,073 contract for fuzes, booster charges, primers and detonators.

Other ammunition contracts include: Beech Aircraft Corp., Wichita, Kans., $3,975,394; Cessna Aircraft Corp., Wichita, Kans., $3,392,132; West Bend Co., West Bend, Wis., $2,951,000; Elgin National Watch Co., Elgin, Ill., $2,012,817; Olin Mathieson Chemical Corp., East Alton, Ill., $1,826,610; and Aerojet General Corp., Downey, Calif., $1,783,600.

Chrysler Motors Corp., Detroit, Mich., received two contracts totaling $4,452,741 for ¾-ton trucks and engines for the M113 personnel carrier and XM106 mortar carrier.

Two contracts aggregating $3,766,883 were awarded to International Harvester Co., Fort Wayne, Ind., for production of tractor trucks. FMC Corp., Princeton, N.J., received a $3,333,970 contract for research of chemical compounds. Evaluation of chemical compounds is the basis of a $3,248,482 contract awarded to Arthur D. Little, Inc., Cambridge, Mass.

A $2,100,000 contract let to Hughes Aircraft Co., Culver City, Calif., is for continued research and development of TOW, the tube-launched optically-tracked, wire-guided missile.

Canadian Commercial Corp., Washington, D.C., received a $2,020,905 contract for portable field telephone sets. Production of electronic equipment is called for in a $2,000,000 contract awarded to Minnesota Mining and Manufacturing Co.

Two universal automatic map compilation systems are ordered in a $1,750,523 contract awarded to Thompson Ramo-Wooldridge, Inc., Canoga Park, Calif. Hayes International Corp., Birmingham, Ala., received a $1,500,000 letter contract for 13 Pershing missile trainers.

Repair parts for the radar used with the Hawk missile system will be produced by Raytheon Co., Lexington, Mass., under a $1,350,000 contract. Sperry Rand Corp., Salt Lake City, Utah, received a $1,336,778 contract for Sergeant missile publications.

Additional contracts included: RCA Electronic Products, Camden, N.J., $1,300,000 for research and development of electronic missile system test equipment; Thiokol Chemical Corp., Bristol, Pa., $1,059,350 for rocket motors and igniters; Columbus Milpar Manufacturing Co., Columbus, Ohio, $1,058,107 for metal parts for antipersonnel mines; Lear Siegler, Inc., Cleveland, Ohio, $1,056,856 for generator assemblies; and Ford Motor Corp., Dearborn, Mich., $1,023,790 for dump trucks.

USALMC Publishes Logistics Study Bibliography

The first annual Department of Defense Bibliography of Logistics Studies and Related Documents has been published and is being distributed by the U.S. Army Logistics Management Center, Fort Lee, Va.

Published by the Defense Logistics Studies Information Exchange (DLSIE) at the Center, the bibliography contains 1,560 listings representing the logistics research efforts of 167 agencies.

Initial distribution is being made to all Department of Defense agencies that perform or have responsibility for the supervision of logistics research. Other interested DoD agencies may obtain copies upon request to the DLSIE.

Within available resources, the Exchange will furnish copies of the bibliography to other agencies of the Executive Branch of the Government and to selected civilian organizations involved in conducting logistics research for the Government.

In addition to information about logistics studies, the bibliography contains significant citations of articles, books and logistics theses of interest to researchers and managers.

The studies and documents identified within the bibliography are indexed by subject and author, using standard terminology specifically designed for logistics information retrieval.

Dissemination and use of the information in the new bibliography is expected to save money by:

- Eliminating the duplication of study efforts.
- Providing better utilization of the findings of logistics research agencies.
- Improving in-house study capabilities.
- Assuring the greatest possible return for each contract logistics research dollar spent.

To select specific information from the large mass of data accumulated, the Exchange uses a large computer system. The U.S. Army Logistics Management Center also uses the system support of logistics simulation exercises.

The printing unit of the computer has a rated printing speed of 600 lines of 120 characters each per minute, which permits rapid retrieval of data and facilitates compilation of bibliographies.

The Center has collected and communicated information about logistics research on an Army-wide basis for the past five years. Selected in 1962 to operate the DLSIE, the Center has the tremendous task of collecting and communicating this information for the entire Department of Defense.

Five OH-5A prototypes now in production are scheduled for Army evaluation early in 1964. The helicopter is to be fitted with an automatically stabilized rotor system, powered by a T63 gas-turbine engine, and designed to achieve speeds 50 percent higher than light helicopters presently in military use.

Duncan Heads HF Division Of Army Research Office

Col Jack M. Duncan, Senior Military Adviser, U.S. Army R&D Operations Research Advisory Group, is the new Chief of the Human Factors and Operations Research Division, Army Research Office, Arlington, Va.

In 1960 he was assigned to the staff of the Research Analysis Corp. (RAC), then known as the Operations Research Office of the Johns Hopkins University. His successor at RAC is Lt Col Leroy D. Brummitt.

During World War II Col Duncan served with the 3rd Infantry Division in posts ranging from company commander to battalion and regimental S-3, division assistant G-3, and regimental commander.

In recent years he has served overseas as Chief, U.S. Army Mission to Ecuador, and as Adviser to the 5th and 11th Infantry Divisions, Korean Military Advisory Group.

Other assignments include Chief, Combined Arms Branch, U.S. Army, Engineer School; Battle Group Commander, 4th Infantry Division; and Post Chief of Staff, Fort Lewis, Wash.

COL BRUMMITT holds an M.A. degree in international affairs from George Washington University as well as a B.S. degree in military science and tactics from the University of Maryland.

An airborne officer during World War II, he served as a battalion commander and parachute battalion S-3. Prior to joining the RAC staff he was Chief, Field Training and Chief, Training Advisory Section, Army Section, MAAG, Taiwan.

Other recent assignments include Battle Group Commander, 101st Airborne Division; Battalion, Post and Deputy RCT Commander, 187th Airborne Regimental Combat Team, Japan; and Regimental Executive Officer, 11th Airborne Division.

Dr. Gregg Takes Journal Job

Dr. Donald E. Gregg, Chief, Department of Cardiorespiratory Diseases, Walter Reed Army Institute, Washington, D.C., was recently named editor of the Circulation Section of the *American Journal of Physiology* and the *Journal of Applied Physiology.*

Acclaimed for his development of equipment and techniques of treating diseases of the heart, Dr. Gregg received the President's Award for Distinguishd Federal Civilian Service in August 1962.

Col Jack M. Duncan

Lt Col Leroy D. Brummitt

Theme of the Month: Transfer of Information

(Continued from page 2)

documentalist. We therefore urge authors of technical papers to—

a. Title papers in a meaty and informative manner (p. 24).

b. Index their contributions with keywords taken from standard thesauri. Societies and editors are urged to establish such thesauri wherever this is practical (p. 25).

c. Write informative abstracts (p. 25).

d. Refrain from unnecessary publication (pp. 25-26).

3. *Techniques of handling information must be widely taught (p. 28).*

Familiarity with modern techniques of information processing is necessary for the modern scientist and engineer. Our colleges and universities must provide instruction in these techniques as part of the regular scientific curriculum. They must also educate in the art of handling information more professionals who can lighten the burden of the technical man and can invent new techniques of information retrieval.

4. *The technical community must explore and exploit new switching methods (p. 30).*

The information transfer network is held together by an array of switching devices that connect the user with the information (as contrasted with the documents) he needs. As the amount of information grows, more ingenuity will be needed to find effective switching mechanisms, if only because the capacity of the human mind places a limit on how much information can be assimilated. The technical community must courageously explore new modes for information processing and retrieval. Among the schemes that ought to be exploited more fully are:

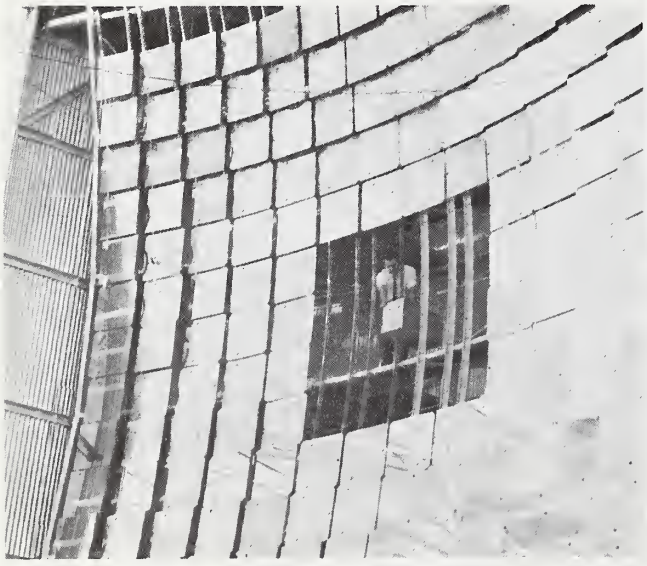
a. Specialized Information Centers (pp. 14, 32-33, 43). The Panel sees the specialized information center as a major key to the rationalization of our information system. Ultimately we believe the specialized center will become the accepted retailer of information, switching, interpreting, and otherwise processing information from the large wholesale depositories and archival journals to the individual user. The Panel therefore urges that more and better specialized centers be established.

We believe the specialized information center should be primarily a technical institute rather than a technical library. It must be led by professional working scientists and engineers who maintain the closest contact with their technical professions and who, by being near the data, can make new syntheses that are denied those who do not have all the data at their fingertips. Information centers ought to be set up where science and technology flourish. We believe that the large, Government-supported laboratories could become congenial homes for groups of related specialized information centers.

b. Central Depositories (pp. 30-32). The central depository to which authors submit manuscripts that are announced and then distributed on request may ease the technical problems of switching documents quickly and discriminately between user (particularly the specialized center) and source. Central depositories are now being used by several Government information systems, and there is little question of their practicality. The Panel, though recognizing the difficulties of replacing the traditional techniques of communication via conventional journals, nevertheless urges technical societies to experiment with central depositories, or some variant thereof (as is done by the American Physical Society), for at least some of their literature.

(Continued on page 22)

Putting Power of the Sun To Work for the Military



Upper right: Heliostat, showing the 356 optically adjusted mirrors that catch sunlight and beam the rays to the attenuator. Center: Artist's sketch of components that make up the solar furnace at the U.S. Quartermaster R&E Command, Natick, Mass. Lower right: Concentrator, consisting of 180 concave mirrors that receive the sun rays from the heliostat (through the adjustable vanes of the attenuator) and direct reflected solar radiation into a 4-inch area in the test chamber.

Nation's Largest Solar Furnace Tests QM Materials

Army research requirements are being served effectively by the Nation's largest solar furnace, capable of intensifying ordinary sunshine into temperatures approaching those generated by a nuclear blast.

Operated by the U.S. Army Quartermaster Research and Engineering Command, Natick, Mass., the furnace is designed for laboratory testing of Quartermaster materials and capable of producing temperatures in excess of 5,000 degrees F.

Objective: protection of the soldier against thermal effects of nuclear and other weapons.

Composed of four major components—a heliostat, a concentrator, an attenuator and a test chamber—the furnace fills a space 125 by 40 feet.

The heliostat is a framework 40 feet long, 36 feet high, bearing 355 optically adjusted mirrors which make up a single reflecting surface. Its basic requirement: to maintain fixed parallel beams of reflected sunlight, by tracking the sun onto the concentrator 96 feet distant.

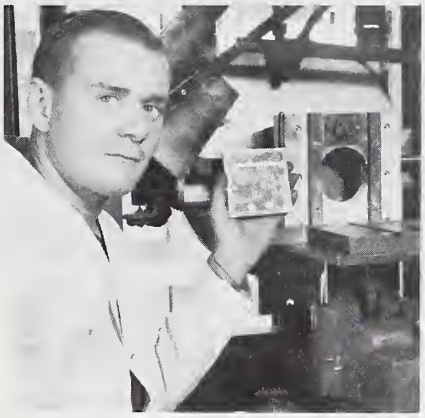
Because of its great latitude of adjustability, the heliostat can obtain usable solar radiation for most of a normally clear day. Its lakeside site also yields an extended horizon.

Concave, rectangular mirrors—180 in all—comprise the concentrator surface, spherical in contour. Each mirror is individually adjusted so that a convergent, tremendously intensified beam is focused into the 4-inch test area within the test chamber. Use of the multiple spherical mirrors effected substantial dollar savings over the continuous-surface mirror.

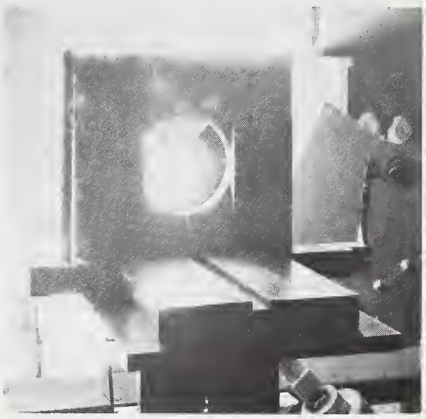
The attenuator, controlling the "feeding" of the solar radiation to the concentrator through its 17 lateral shutters, also serves as a safety mechanism. In case of over-radiation, or in case of power failure or other emergency, it automatically closes.

All controls and the laboratory testing equipment are housed in the test chamber. With its 8-foot-square face and 16-foot length, it matches the apertures centered in the concentrator and attentuator. About two feet inside its window is the 4-inch focal point of the built-up solar radiation.

Materials under test are subjected to short, shutter-controlled exposures of high thermal flux. Quartermaster scientists emphasize that, while reference is often made to "high temperatures" to aid understanding of the solar furnace function, the actual product is a pulse of extremely intense heat, used for fast exposures.



Steel sample held by technologist is placed in frame at right and exposed to the concentrated sun's rays in a demonstration of the solar furnace.



Rays of the sun, reflected from 180 mirrors of the concentrator to a 4-inch diameter spot, flame through the steel sample in demonstration of the sustained temperatures of 5,000° F.

QMREC Scientist Establishes Fund for Coworkers

A $5,000 scholarship and research trust fund for secretaries, stenographers and technical personnel was announced Mar. 26 at the U.S. Army Materiel Command's QMREC, Natick, Massachusetts.

Dr. Edward F. Degering, Head of the Radiation Chemistry Laboratory at the Quartermaster Research and Engineering Command Laboratories, became the first employee to establish a fund for the benefit of present and future coworkers.

Founded as an irrevocable trust, the fund provides an income geared to the needs of secretarial personnel desiring more scientific knowledge to help them in dictation and written reports. Aid will be extended to all qualified clerical workers, students and research chemists as the fund's income increases through the years.

A former chemistry professor at Alberta Canadian Junior College, University of Nebraska, and Purdue University, Dr. Degering authored more than 150 scientific and educational papers and textbooks. He believes secretaries, as an employee group, are often overlooked in specialized training.

"This fund," he said, "will help those who would like to take a few months of specialized training. At the same time, it should encourage Government careers."

The Edward F. Degering and Clara M. Degering Trust Fund is named in honor of the research chemist and his wife, who died in 1962. Mrs. Degering was a high school mathematics teacher for 25 years.

Dr. Edward F. Degering

Environmental 'Sweat' Study Scheduled for Edinburgh Parley

Results of a U.S. Army experiment in which three men spent 7½ hours each day for 16 consecutive days in an environmental chamber at 100° F. will be presented in a paper at the 6th International Congress of Nutrition in Edinburgh, Scotland, Aug. 9-15.

The paper "Mineral Losses in Sweat and Their Relationship to Balance and Requirements" was prepared by C. Frank Consolazio, Le Roy O. Matoush and Richard A. Nelson, U.S. Army Medical Research and Nutrition Laboratory, Fitzsimons General Hospital, Denver, Colo.

Abstracts from the paper indicate that taking all sweat losses into account (many which have been completely ignored in past balance studies) will permit more realistic minimal daily nutrient estimates.

Research Analysis Corporation's research center (artist's sketch) under construction in McLean, Va.

RAC Plans Move from Maryland to Virginia

The Research Analysis Corporation has signed a 15-year lease on its new research center, now under construction in McLean, Va. RAC's present headquarters are scattered in five buildings in Bethesda, Md.

RAC President Frank A. Parker said the Washington, D.C. area's largest operations research firm, established in September 1961 as approved by Assistant Secretary of the Army (R&D) Dr. Finn J. Larsen, will move into its new headquarters in November.

As the successor to the Operations Research Office under an Army contract with Johns Hopkins University, RAC performs most of the Army operations research projects.

Most of the grading for the roads and parking lot and a major portion of the foundation work were completed before the onset of winter, and construction is proceeding rapidly.

"The new center," Mr. Parker explained, "will not only enable us to consolidate all 10 of our Divisions and allow for anticipated expansion, but it will provide RAC with easier access to military planners in the Pentagon.

"In the new center, we have tried to create a physical plant in which scientific productivity can flourish to the greatest possible degree. The working environment will have much of the college campus about it."

Contemporary in concept, the layout of the research center permits the maximum number of offices to receive sunlight. Featured is a central auditorium seating 250 people, to be used for conferences and symposia.

The RAC staff totals more than 450, of whom nearly one-half are engineers and scientists. The organization is an independent nonprofit corporation. Objectives are the scientific study and solution of global military problems and related technical, political and economic questions.

Alfred Kastner and Associates served as architects for the research center. The general contractor is Eugene Simpson Bros., Inc.

Redstone Agencies Offer Aerospace Lecture Series

A special lecture series in aerospace science and engineering is offered by the joint graduate study steering committee of the U.S. Army Missile Command, Redstone Arsenal, Ala., and the Marshall Space Flight Center.

John P. Hallowes, Chief of the Command's Physical Sciences Laboratory and chairman of the committee, said that the lecture will supplement work assignments of technical personnel to be employed at Redstone Arsenal during the summer.

Every summer the two Redstone-based space-age agencies employ a number of scientific and engineering students and teachers, 75 of whom will be selected to participate in the lectures. Starting in early June the lectures will be conducted 4 hours per week for 10 weeks as a part of the regular work assignments of the summer employees.

Lecturers will be drawn from among top engineers and scientists in the Government and from visiting professors.

Covered will be a broad area of subjects intended to acquaint the college students and teachers with the problems encountered by Government engineers and scientists, and to show them how engineering and scientific theories are being applied to missile and space technology.

Subject material will include propulsion, aerodynamics, thermal engineering, guidance and control, orbital mechanics and systems engineering.

Through the lecture series, the summer workers will have a more comprehensive understanding of these problems when they return to their respective schools in the fall.

Students on either the graduate or undergraduate level, and faculty members interested in participating in the program, may make application to either the Civilian Personnel Office, U.S. Army Missile Command or the Professional Staffing Office, Marshall Space Flight Center.

2 Mathematicians Accept Analyst Posts With RAC

Mathematicians Horace C. Hearne, Jr., and Lee G. Wentling, Jr., recently joined the Research Analysis Corporation of Bethesda, Md., as operations analysts.

Assigned to RAC's Weapons Systems Division, Hearne formerly worked at du Pont of Canada, Ltd., in Montreal where he was concerned with engineering, statistical and operations research problems.

After receiving a B.S. degree in physics at Louisiana State University, he was awarded an M.S. in mathematics by the Massachusetts Institute of Technology and has completed work toward a Ph. D. in mathematics at the University of Wisconsin.

WENTLING has joined the Operational Logistics Division of RAC. From 1954 to 1962, he was design engineer and head of the analytical section, arms group, of Aircraft Armaments, Inc., Corkeysville, Md. He had previously been with the Rheem Manufacturing Co. of Philadelphia.

After receiving a B.A. degree in mathematics from Swarthmore College, he did graduate work at the University of Pennsylvania and at The Johns Hopkins University. He is a member of the Society for Industrial and Applied Mathematics and is an associate member of the Operations Research Society of America.

DoD, Industry to Meet at Power Sources Conference

Industrial and educational leaders will join with Department of Defense researchers on advanced power sources at the 17th Annual Power Sources Conference at Atlantic City, N.J., May 21-23.

The conference is under sponsorship of the Power Sources Division, U.S. Army Electronics Research and Development Laboratory, Fort Monmouth, N.J., and attendance is limited to invitees.

Seven sessions are scheduled to consider both formal and informal presentations on solar energy conversion, thermal energy conversion, fuel cell batteries, the future of fuel cells, secondary batteries, primary batteries, and electrical energy conversion.

The conference is the largest of its kind and attracts representatives from U.S. and foreign governments, industries and universities.

Army speakers on the program are S. J. Shapiro, G. Hunrath, W. Dudley, J. Angello, H. Hunger and B. Resnic of the Electronics R&D Laboratory and B. C. Almaula of the Engineer R&D Laboratory.

Ernst Cohn, formerly with the U.S. Army Research Office and now with the National Aeronautics and Space Administration, will discuss "Space Applications." U.S. Air Force and U.S. Navy presentation are stated.

Other speakers will represent Battelle Memorial Institute, the Institute for Defense Analysis, Textron Electronics, Inc., Westinghouse Electric Corp., Johns Hopkins University, Calvin College, General Instrument Co., Radio Corp. of America, Ford Instrument Co., North American Aviation.

United Aircraft Corp., General Motors Corp., Electric Autolite Co., Magna Corp., Melpar, Inc., Institute of Gas Technology, Engelhard Industries, Eagle-Picher Co., Gulton Industries, Inc., Cook Electric Co., Dow Chemical Co., Monsanto Research Corp., Minneapolis-Honeywell Regulator Co., United Aircraft Corp.

BRL Scientist Earns SA Fellowship Award

Leland A. Watermeier, combustion chemist at the Ballistics Research Laboratories, Aberdeen Proving Ground, Md., recently received a Secretary of the Army Research and Study Fellowship for his contribution to Army weaponry progress.

Associated with research on solid fuels for rockets, Watermeier is head of the combustion section of the Interior Ballistics Laboratory.

Col Richard R. Entwhistle, BRL commander, commented: "This award is a great honor to the Laboratories, and attests to Mr. Watermeier's outstanding ability."

Beginning in September, Watermeier will work at the Imperial College of Science and Technology of the University of London under Dr. Felix J. Weinberg, acknowledged one of the world's foremost combustion scientists.

A major portion of Watermeier's work will involve study of the movement of ions—electronically charged particles—in flames to seek methods of stabilizing solid-fuel combustion processes in missiles. Instability in burning of these fuels produces erratic behavior in the missiles' flight paths, causing them to miss marks.

Secretary of the Army Research and Study Fellowship winner Leland A. Watermeier receives congratulations from Col Richard R. Entwhistle.

Watermeier's research will take him to important combustion centers in Europe, including Louvain and Brussels, Belgium; Gottingham, Germany; Stockholm, Sweden; Chatillon-sous-Bagneaux (Seine), France; Cambridge and Oxford, England.

At 35, he is one of the youngest men serving on the Tri-Services Propellant Combustion Instability Panel, which represents the Department of Defense in coordinating and planning efforts of the Army, Navy and Air Force in combustion research.

A native of Litchfield, Ill., he received a B.A. degree from Blackburn College in 1950, and an M.S. degree from the University of Delaware in 1955. He was a chemist with Wilson and Co. of Chicago before joining the Ballistic Research Laboratories in 1951.

Biological Laboratories Pfc Draws College Plans

A soldier at the U.S. Army Biological Laboratories, Fort Detrick, Md., has been acclaimed for his work on plans for a complete junior college with a building complex valued at $1,750,000. Pfc Alfred Gary, Jr., a native of Texas, by special arrangement with Col Carl S. Casto, Laboratories commander, prepared four building plans for the Frederick County Commissioners and the Frederick County School Board. His supervisor, Paul H. Teare of the Physical Defense Division, presented the plans Gary drew on his own time.

Pfc Alfred Gary

In letters to Col Casto and Mr. Teare, President Sweadner of the Frederick Community college stated:

"Your interest and cooperation which made it possible for us to have such excellent drawings of suggested building plans for the college are greatly appreciated. Pfc Gary certainly deserves commendation for preparing such complete drawings which were so well presented to our Board and County Commissioners."

Pfc Gary is a graduate in architecture from Prairie View A&M College, Prairie View, Tex. "I was happy," he said, "to volunteer my services for the job. It was good experience. I was interested in finding out if my ideas would be acceptable in this part of the country. There are regional differences in architectural concepts based on climate, terrain, taste and many other factors."

Tigertt Succeeds Milburn as WRAIR Commandant

Col William D. Tigertt relieved Col Conn L. Milburn as Director and Commandant of the Walter Reed Army Institute of Research (WRAIR) effective Mar. 1. Nominated for brigadier general rank, Milburn has been reassigned to the Office of the Surgeon General.

Most recently director of field teams in Southeast Asia and a member of the Military Assistance Advisory Group in Teheran, Iran, Col Tigertt served in 1949 as Assistant Commandant and later became Chief of the Special Operations Branch at WRAIR.

The colonel began his military career in 1940 after receiving his medical degree from Baylor University College of Medicine and serving there as an instructor in pathology.

Initially assigned to Brooke General Hospital as a pathologist, he served during World War II as commanding officer of the 26th Army Medical Laboratory in New Guinea, the Philippines and Japan. Following the war he remained in Japan to command the 406th Medical General Laboratory and serve as Laboratory Consultant to the Surgeon of the Far East Command.

In recent years he has been an associate professor of medicine at the University of Maryland School of Medicine, a consultant on infectious diseases to The Army Surgeon General, and a consultant to the World Health Organization.

Col William D. Tigertt

Army Medic Discusses Need For Biomedical Engineering

Biomedical engineering research as an area of increasing importance to the Army was discussed at a Mar. 29 conference sponsored by the State of Illinois and Northwestern University in Chicago.

Lt Col Donald L. Howie, MC, Chief of the Medical Research Branch of the U.S. Army Medical Research and Development Command, said biomedical engineering,a relatively new term, defines methods heretofore unnamed. For example, the invention of a simple item such as the thermometer is a product of biomedical engineering.

The term is more commonly associated with the development of such items as the Army's new artificial heart pump or intricate instruments where physicians, scientists and engineers are vitally involved in the design and fabrication of the product.

The broad purpose of biomedical engineering in the Army, Col Howie said, is in improving methods of diagnosis and treatment of illnesses, injury and wounds, and in developing methods, equipment and facilities which adapt to every conceivable military operational requirement.

Attended by business leaders, educators, scientists, physicians, Government officials and others, the conference served to show the new Biomedical Engineering Research Center at Northwestern University and to direct attention to other biomedical opportunities for scientists and industry in the Chicago area.

Theme of the Month: Transfer of Information

(Continued from page 17)

c. Mechanized Information Processing (pp. 20-21, 34-35). The Panel recognizes that mechanical equipment offers hope for easing the information problem. Commercially available equipment is not the remedy in every case; economics, size, frequency of use, growth rate, depth and sophistication of indexing must be examined in detail for each collection before a specific system is to be mechanized. There is a need for equipment specifically designed to retrieve documents from very large collections. The recent study under the auspices of the Council of Library Resources, recommending automation of the Library of Congress, should be evaluated with a view toward its implementation both as a means of improving the services offered by the Library and of advancing the art of automatic retrieval.

d. Development of Software (p. 35). Hardware alone is not a panacea for difficulties of information retrieval. Software, including methods of analyzing, indexing, and programing, is at least as necessary for successful information retrieval. The Panel wishes to call the attention of the technical community to a promising new method of access to the literature called the citation index: a cumulative list of articles that, subsequent to the appearance of an original article, refer to that article.

5. *Uniformity and compatibility are desirable (p. 36).*

Since the entire information system is a network of separate subsystems, rapid and efficient switching between the different elements of the system is essential. Such switching will be fully effective only if the different subsystems adopt uniform practices toward abstracting and indexing. We commend the Office of Science Information Service (OSIS) of the National Science Foundation for trying, through the National Federation of Science Abstracting and Indexing Services, to encourage order in a chaos of non-uniformity. We believe that Government, by virtue of the financial support it gives to private information services, should exert leverage in persuading societies to adopt more uniform practices.

B. *Recommendations to Government Agencies*

We preface our recommendations to the Federal Agencies with the statement that Government information activities must not be allowed to swamp non-Government activities. The special sensitivity of non-Government, decentralized information services to the needs of the user as well as the variety of approaches offered by these services is precious and must be preserved. Support by Government does not necessarily mean domination by Government but this danger must always be guarded against.

1. *Each Federal agency concerned with science and technology must accept its responsibility for information activities in fields that are relevant to its mission. Each agency must devote an appreciable fraction of its talent and other resources to support information activities (pp. 44ff).*

Since the information process is part of the research and development process, agencies that support research and development in fields that are relevant to their missions accept responsibility for supporting and otherwise carrying out information activities in these fields. Each of the mission-oriented agencies ought to become "delegated agents" for information in fields that lie within their missions. In these fields the agencies should maintain a strong internal information system and should support non-Government information activities, always striving to blend the Government and non-Government systems into a consistent whole.

2. *To carry out these broad responsibilities each agency should establish a highly placed focal point of responsibility for information activities that is part of the research and development arm, not of some administrative arm, of the agency (p. 45).*

We stress that the technical information activities of an agency must be part of research and development, not part of administration.

3. *The entire network of Government information systems should be kept under surveillance by the Federal Council for Science and Technology.*

We applaud the recent action of the FCST in establishing an interagency Committee on Science Information. Among other matters, this committee will be expected to prevent overlaps and omissions as the agencies becomes delegated agents in various fields of science and technology.

4. *The various Government and non-Government systems must be articulated by means of the following information clearinghouses:*

a. Current Efforts Clearinghouse (pp. 46-47). We recommend that the Science Information Exchange (that provides information on who does what where) be strengthened and that it receive separate support rather than depending on voluntary contributions from the agencies it serves. A Technological Efforts Exchange, either as part of SIE or working in close collaboration with it, should be established.

b. Report Announcement and Distribution (p. 47). We recommend that the Office of Technical Services of the Department of Commerce be made a complete technical reports sales agency. It should be given enough support so that it can announce promptly and supply inexpensively a copy of any declassified Government technical report.

c. Retrospective Search and Referral Service (pp. 47-48). We approve the recent action of NSF and the Library of Congresss etablishing a National Technical Referral Center as part of the Library of Congress.

In addition, the National Referral Service should maintain and make available a directory of Specialized Information Centers and a register of formal technical meetings.

5. *Each agency must maintain its system in effective working order (pp. 38-43)*

The internal communication system is based largely on informal technical reports. We offer the following recommendations for improving the dissemination and retrieval of information contained in the technical reports:

a. Technical reports should be referred or otherwise screened before they enter the internal information system (pp. 39-40).

b. Agencies must insist that their contractors live up to their contractual obligation for adequate technical reporting. We believe that proprietary interests sometimes serve as barriers to proper flow of information. We recommend that the whole matter of defining what are and what are not propietary rights in Government contracting be subjected to a Government-wide study.

c. Although the Panel sees no cause for alarm in the way classification is now handled by Government agencies, this impression is largely an intuitive one. We therefore recommend that problems of security and declassification be studied by an ad hoc group of the Federal Council's Committee on Information (pp. 41-42).

d. Since the report literature is often poor, critical review of the report and related literature plays an important role. Critical review journals published under Atomic Energy Commission auspices have been generally successful; we urge other agencies, notably National Aeronautics and Space Administration and Department of Defense, to undertake similar review ventures in fields of interest. Such review journals might well become a most important product of the specialized information centers.

e. We believe that the large central agency depository should concentrate on being a document wholesaler, and that, where specialized centers exist, the job of preparing state-of-the-art reviews, and otherwise interpreting the literature, should be the responsibility of the specialized information center.

f. Since these latter activities are so important to the effective transfer of information, we believe that the agencies concerned should actively sponsor and support additional specialized information centers at appropriate establishments (pp. 33, 43).

6. *Problems of scientific information should be given continued attention by the President's Science Advisory Committee (p. 51).*

The problems of scientific information are very complex and they will continue to be with us. We therefore recommend that scientific information, and particularly the balance between Government and private activities, be given continued attention by the President's Science Advisory Committee.

Voice Rides Beam of Light In Communications System

The human voice is riding a beam of light at White Sands (N. Mex.) Missile Range in what is termed one of the simplest and least expensive communications systems ever built.

Tom Coffee, a young engineer in the U.S. Army Electronics Research and Development Activity, built the device, named MOLITE (for modulated light transceiver). One transmitter-receiver, installed in the penthouse of a laboratory, shoots to another on the Elephant Mountain, 20 miles away.

A small 75-watt arc light in each transceiver forms a narrow beam focussed by standard optical lenses. The actual light energy is only a quarter watt, and the 2-way voice waves "ride" the beam much as voices ride radio frequency beams.

MOLITE makes available an entire new portion of the frequency spectrum, important in an area where radio waves seriously crowd the air.

The device has no audible background noise. The voice comes through crystal clear, "with no pop, no hum, no crackle." As Coffee puts it: "MOLITE should be a welcome new system at all missile test centers because it adds a voice communications system without adding interference problems."

4 Contracts Let to Develop New Weapon for Individuals

Development of prototypes of a special purpose, hand-held weapon for use in Special Forces and Infantry units is called for in four contracts recently awarded to industrial firms and a Government facility.

Known as the "Special Purpose Individual Weapon" (SPIW) and weighing no more than the current M-14 rifle, it could be used as both a shoulder-fired grenade launcher and a rifle. By enabling the combat soldier to engage and point targets more effectively, it will enhance firepower.

Prototypes of the weapon will be delivered to the Army by February 1964 for test and evaluation. One of the designs will be selected for completion of development and subsequent engineering and service tests.

R&D contracts awarded went to Aircraft Armaments, Inc., Cockeysville, Md.; Winchester-Western Division, Olin Mathieson Chemical Corp., New Haven, Conn.; Harrington and Richardson, Inc., Worcester, Mass.; and Springfield Armory, Mass.

Personnel Stabilization in RDT&E Programs

By Capt James H. Brill, Ordnance Corps

Important goals of the U.S. Army Materiel Command are coming into sharper focus as the AMC passes the mid-way mark of its first year of existence. The most ambitious, and among the most urgent, is that of reducing from approximately seven to four years the time necessary to develop, produce, and place in the hands of soldiers new materiel, ranging from vehicles to missiles.

Reduction in lead time—the period required to perform the necessary research, development, test and evaluation (RDT&E) of a new item of equipment—will result in monetary savings. Of greater significance, however, is that the American soldier will receive when needed the most advanced types of materiel to shoot, move, and communicate better than any other soldier in the world.

The goal of reduced RDT&E time is a natural outgrowth of the great technological strides made in recent years, especially in the missile system field. To make maximum use of technological breakthroughs, it is essential that development time be reduced to the minimum consistent with sound operational practices.

To accomplish a 3-year reduction in idea-to-hardware time, the Army Materiel Command is initiating special testing and management methods. Three of the more important of these are Integrated Testing, Program Evaluation Review Technique (PERT), and the Project Manager Concept.

Integrating of engineer and service tests as opposed to sequential testing, i.e., three separate and distinct test phases (contractor—engineer—service), will be effected wherever possible. The Nike Zeus RDT&E program represents one successful application of this method. Integration has been carried one step further in that engineer and service test agencies are working with the contractor in tests to meet common Zeus objectives, resulting in savings in time and development costs.

The PERT system was a keystone of the "Polaris Approach" in the RDT&E of the U.S. Navy's submarine missile system. It ensures the rapid and accurate determination of potential problem areas and enables the timely application of special attention to the detected problem area.

The Project Manager Concept represents a dynamic and important step forward to accelerate development programs. It gives one officer "across-the-board" responsibility and authority for the management of selected weapon system programs. Normally he is assigned to a program which because of high dollar cost, high sensitivity or high priority (or all three) requires centralized management.

Approximately 30 Materiel Command programs are being expedited through Project Managers, and they have direct access to the Commanding General, Lt Gen Frank S. Besson, Jr. This centralized management system places the burden upon them to make timely decisions based upon the facts.

Appointment of a Project Manager in itself accomplishes a secondary objective—that is the creation of a sense of urgency, critical to all program activities geared to the reduction of idea-to-hardware time.

As efficient as these relatively new testing and management methods are, they will not in themselves enable the attainment of a 4-year or less idea-to-hardware time. They must be combined with a sufficient quantity of qualified operating personnel. The most practicable and advantageous means of satisfying this personnel requirement is to stabilize individuals in key positions in selected RDT&E programs for periods up to four years. The criteria for selection could be the same as that for placing a program under a Project Manager.

Stabilization of personnel in key RDT&E positions is really another way of saying reduction of personnel turnover. The Armed Services and industry have long recognized that high personnel turnover is costly and reduces productivity. They are constantly seeking for and providing new inducements, such as industry profit-sharing plans and service proficiency pay, to cut personnel losses.

Stabilization of key personnel in selected RDT&E programs insofar as is possible is sound business. Loss of key individuals during the early phase interrupts program continuity, leads to target date slippages, and is costly in effect upon that vital sense of urgency among those who remain. It vitiates the maximum effort drive.

In the majority of cases, key individuals must attend special training schools conducted by the contractor to familiarize them with the new materiel under development, including checkout, operation, and maintenance procedures. Several weeks of on-the-job experience usually is necessary before an individual can begin to contribute effectively to a test program.

A transition period from "theory to hardware" is needed for a new man to adjust to working with the new materiel, to learn local procedures, and to establish effective relationships

Dr. Sherwin Appointed Deputy Director, ODDRE

Dr. Chalmers W. Sherwin has been selected Deputy Director for Research and Technology, Office of the Director of Defense Research and Engineering, and is expected to fill the newly established position about June 1.

Currently employed as Vice President and General Manager of the Laboratories Division, Aerospace Corp., Dr. Sherwin served as Chief Scientist of the U.S. Air Force in 1954-55. Upon leaving that assignment he was awarded the Medal for Exceptional Civilian Service. He also has served various Government agencies as a consultant.

Born at Two Harbors, Minn., Nov. 27, 1916, he was an educator and a research administrator prior to entering Federal service.

Graduated in 1937 from Wheaton College, Ill., with a B.S. degree, he received his Ph. D. in physics from the University of Chicago (1940) where he was an assistant in physics.

A member of the staff of the Radiation Laboratory, Massachusetts Institute of Technology from 1941 to 1945, he was in the Physics Department at Columbia University in 1946.

During the next five years he advanced from assistant professor to professor of physics at the University of Illinois. In 1954 he was granted a leave of absence to become Air Force Chief Scientist. He has been with the Aerospace Corp., Los Angeles, Calif., since 1960.

Dr. Chalmers W. Sherwin

with the contractor personnel. A work environment of mutual confidence, respect and cooperation contributes greatly to the meeting of program schedules and test objectives.

A precedent for stabilizing key military personnel has been established by the stabilization of Artillery and Ordnance personnel for periods up to four years in the Nike Zeus RDT&E program. Consequently, the Army has made maximum use of the special schooling and experience of highly skilled military personnel.

Stabilization of personnel does not necessarily mean that all individuals will remain at one location for the entire RDT&E period. In many cases, it may be required and desirable to rotate men between locations.

In the Zeus program, for example, personnel were trained at White Sands Missile Range (WSMR) in special contractor-conducted schools. After serving the WSMR Zeus program for one to two years, they were assigned to the Kwajalein Island Zeus test site for one year. In many cases they have worked there with the same contractor personnel as at WSMR.

Upon their return from Kwajalein, a number of men will be assigned to the Zeus Training Section, U.S. Army Missile Command and others to the WSMR Zeus test effort.

In general, stabilization on the Nike Zeus has been well received by all personnel and has, in fact, been responsible for attracting to the program skilled enlisted technicians.

Careful screening by tests and personal interviews should precede stabilizing of any individual in a key position in an RDT&E program, to ensure the highest caliber of personnel obtainable. Regardless of selection methods used, some men will fail to meet the high standards of technical competence and personal conduct required, and should be replaced.

A 4-year stabilized tour in a major RDT&E program has proved successful on the Zeus project. The probability of success in other RDT&E programs is great, when considered in the light of the Army Materiel Command's goal of a 4-year idea-to-hardware development time. Certainly it should be considered as another method to supplement the special test and management techniques being utilized to streamline, without degradation, the development of new materiel.

To many this concept of personnel stabilization in key positions may seem incompatible with established personnel policies. However, when considering the goal to be attained, it seems to me a logical and necessary step in selected RDT&E programs to achieve maximum results in minimum time at the lowest practicable cost.

Dr. Forbes, Nutrition Expert, Joins USARO Staff

Dr. Allan D. Forbes has joined the staff of the U.S. Army Research Office as a physiologist in the Scientific Analysis Branch, Life Sciences Division.

Formerly with the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health as a Public Health Service medical officer, he holds an M.D. degree from the Medical College of Virginia (1953).

Following a year of internship at Montreal General Hospital, he returned to the Medical College of Virginia for a 2-year residency in internal medicine. Concurrently he served as a medical consultant to Charles C. Haskell & Co.

From 1956 to 1958, as a captain, he served as Chief, Clinical Physiology Branch, Physiology Division, U.S. Medical Research and Nutrition Laboratory, Fitzsimons General Hospital, Denver, Colo. He was a clinical investigator (1958-61) with the Veterons Administration Hospital in Richmond, Va., and also served as a lecturer in internal medicine at the Medical College.

Certified as a specialist in human nutrition by the American Board of Nutrition, he has served as Assistant Director for Medical Programs, Interdepartmental Committee of Nutrition for National Defense, and directed nutritional surveys of the Republic of Vietnam (1959) and the Kingdom of Thailand (1960).

Recipient of several scientific awards, he has published extensive works in the areas of international nutrition, metabolic diseases and specific clinical nutrition lesions.

Dr. Allan D. Forbes

WSMR Lists Qualifications Of Top Civilian Employees

What does it take to be a top civilian employee at White Sands Missile Range, N. Mex? Here are some—but not all—of the qualifications found among 127 of the top males employed by the Government at the national missile range.

Seven of the men have Ph. D. degrees, 25 have master's degrees, 63 have bachelor's degrees, one an honorary Ph. D. One is candidate for a Ph. D., one holds LL.B., and one a medical degree.

Of those married—only three are not—eight have no children and one has six; 23 have one child; 31 have two; 37 have three; 19 have four, and 8 have five, a total of 326 future scientists.

The majority of the men serve in a technical capacity as engineers or scientists. In fact, 107 hold positions of that type compared to 20 who are administrators in such fields as personnel and procurement.

Six of the men have worked for the Government between 25 and 33 years; 16 from 21 to 24 years; 44 from 15 to 20 years; 61 from 1 to 14 years.

In addition to English, 18 of the group speak German, 23 Spanish, 13 French and three Russian.

Job classifications range from GS-11 to professional with more than half falling in the GS–14 category—salary from $12,845 to $16,245 a year. Job distribution, comparable to the old curve-grading systems, includes 3, GS-11; 5, GS-13; 88, GS-14; 26, GS-15; and five in the highest professional category.

USAERDL Hosts ASCE Meeting

The U.S. Army Mobility Command Engineer Research and Development Laboratories, Fort Belvoir, Va., were hosts on Apr. 1 to the National Capital Section of the American Society of Civil Engineers annual dinner meeting.

Several of the host agency engineers and scientists discussed some of the latest developments by the Laboratories. The speakers this year were Benjamin F. Whaley, Robert K. Hedrick and Emil F. York.

Whaley told of "hasty storage," including the development of a collapsible tank capable of holding 10,000 barrels of fuel. Hedrick spoke on "Buildings in Barrels," a concept based on the shipment of barrels of liquid plastic to the construction site. There the chemicals are mixed to form a rigid building material, providing 30 cubic feet of material for each cubic foot shipped.

Canaveral Tests Take Pershing on Overland Trek

An overland movement of a Pershing ballistic missile and a full set of tactical equipment from Orlando to Cape Canaveral, Fla., is part of a series of tests scheduled at Cape Canaveral. Tactical vehicles designed to carry Pershing over rugged terrain into a combat zone will be used on public roads for the movement.

Directed by Col O. M. Hirsch, Pershing Project Manager, tests involve participants from the Army Missile Command at Redstone Arsenal, Ala., the Army Artillery Board, Fort Sill, Okla., and the Martin Co., prime contractor for the system.

The operation will also include rough overland marches and simulated tactical exercises on unprepared terrain. Troop participation will mark the combining of service test missions as well as continuing development objectives.

Prior to being transported to Cape Canaveral, the tactical equipment will undergo a series of "rough road" tests on a bouncy course to prove out capabilities to operate over virtually any type of terrain.

No warheads will be used in the march and the missile cannot be fired until it is assembled at Cape Canaveral. The missile and its Ground Support Equipment will pose no safety hazards during the overland trek.

Pershing is a 2-stage selective range weapon, for field Army support. The system is designed to be moved by Chinook helicopters overland on tactical vehicles like those to be used in the march, or in fixed wing aircraft.

The weapons system has been labeled "Shoot and Scoot" for its unique ability to move quickly. Components of the system can be lifted to the firing position by helicopters and assembled in that vicinity.

Pershing is being developed under Army Missile Command supervision to replace the larger liquid-fueled Redstone which has been operational for several years. Under a wide variety of test conditions in recent months, the Pershing has established an exceptional record of proving out operational objectives.

2 NDL Scientists Earn Outstanding Ratings

Dr. Hans J. Tiller

Walter R. Van Antwerp

Accomplishments of two research scientists on the staff of the Nuclear Defense Laboratory at Edgewood Arsenal, Md., a field agency of the U.S. Army Materiel Command, recently earned them Outstanding Performance Ratings.

Dr. Hans J. Tiller, Chief of the Nuclear Physics Division, was commended for outstanding performance during the period from May 1, 1961 to Apr. 30, 1962. Walter R. Van Antwerp, Chief of the Solid State Physics Branch, was cited for his performance Oct. 1, 1961 to Sept. 30, 1962.

Included in the justification of the OPR for Dr. Tiller was a review of the significance of his contributions to the progress of the NDL research program in radiation and nuclear physics. He serves as a member of the Radiation Shielding Subcommittee of the National Academy of Sciences-National Research Council, and received his Ph. D. degree in physics from the University of Innsbruck, Austria.

The commendation of Mr. Van Antwerp noted that he has developed an initial gamma ray spectrograph to measure the energy spectrum of gamma radiation from a detonating nuclear weapon to satisfy a military requirement for nuclear weapons effects information, and also has made contributions to advance development of solid-state radiation detectors. He holds an M.S. degree in physics from the University of Maryland.

PM-2A Nuclear Plant Sets Continuous Power Record

The U.S. Army PM-2A nuclear power plant at Camp Century, Greenland, 900 miles from the North Pole, claimed a new record early in March for continuous operation of land-based military plants—2,504 hours.

Shut down briefly for scheduled maintenance, the PM-2A—the Army's pioneering effort in cooperation with the U.S. Atomic Energy Commission to meet military power requirements in remote areas—had operated without interruption of service since Oct. 30, 1962.

The previous record of 1,038 hours was also set by the PM-2A, which might be termed the first progeny of the world's first military nuclear power plant at Fort Belvoir, Va., completed in 1957 as a joint AEC-Army R&D effort.

First of the Army's prefabricated nuclear power plants, the PM-2A was installed at Camp Century in the fall of 1960. Assembled and tested prior to shipment, the reactor became "critical" 78 days after delivery of the first packaged unit.

The plant was designed for use in Greenland because of its high reliability and logistical independence. It now requires refueling only once every two years and replaces a diesel fuel requirement of about 1,600,000 gallons per year that would be required to power Camp Century.

Designed and built under the supervision of the AEC-Army Nuclear Power Program, the PM-2A is operated by the U.S. Army Polar Research and Development Command.

Missile Command Lets Contract

Award of a $1,300,000 contract for continued development of multisystem test equipment designed to perform field support of the Mauler and future missile systems has been announced by the Army Missile Command, Redstone, Ala.

The Radio Corp. of America Defense Electronic Products Division will produce several prototypes for test and evaluation by the Army Missile Command. The award brings the total under a 6-year development program for the system to $6,500,000.

APG Develops Way to Limit Air-Blast Property Loss

Relief from the problem of air-blast damage to military and private property in the area of Army proving ground and test agencies is promised by control measures being developed at Aberdeen Proving Ground, Md.

Beauregard Perkins of the U.S. Army Ballistic Research Laboratories has devised a system, based on the evaluation of meteorological conditions affecting the propagation of sound waves, to avoid damage to structures in military test areas.

An Aberdeen P.G. report claims the method permits realistic evaluation of the validity of claims brought against the Government for blast damages. Complaints, it was stated, have been reduced to five percent of what they were when the system was first tested five years ago.

Several other agencies of the Army, Navy and Air Force have also adopted the technique.

In mid-March Perkins conducted a 3-day class at BRL on the method. Twenty-one representatives of U.S. Army Materiel Command agencies in many parts of the U.S. attended.

The method is based on the principle that changes in the velocity of the blast wave emanating from explosions determine the path of the wave through the atmosphere.

Changes in the velocity of sound are, in turn, produced by variations in temperature and humidity of the air and the speed and direction of the wind. The effect of humidity is actually negligible and only the three factors need be considered.

By taking measurements of temperature and wind conditions at set intervals of altitude and plotting the changes, the paths of sound waves through the atmosphere are traced.

If measurements indicate that the sound waves will move out uniformly in all directions or will be refracted upward, firings may be conducted. If, however, the sound waves will be refracted toward the ground or will converge in a limited area distant from the firing point, detonations of only small quantities of high explosive are permitted until more favorable conditions exist.

Air-blast damage results mainly from the second set of conditions. Detonation of large charges consequently is permitted only after the determination and evaluation of the meteorological conditions.

Classes in this technique for evaluation of meteorological conditions are planned for the summer and fall for representatives of proving ground and test agencies in the U.S.

BRL Mathematician Named 'Civil Servant of Year'

Lloyd Wayne Campbell of the Ballistics Research Laboratories at Aberdeen Proving Ground, Md., has been named "Civil Servant of the Year" by the Federal Business Association of Maryland.

During a testimonial luncheon in Baltimore on Mar.. 13, he was awarded a certificate for his contribution to the design and programing functions of Ballistic Research Laboratories Electronic Scientific Computer (BRL-ESC), one of the world's fastest computers (see April 1962, issue, page 3).

Brig Gen (Ret.) John H. Weber, former Commanding General, Aberdeen Proving Ground, sponsored his nomination for the award.

Graduated in 1950 from Wittenberg College, Springfield, Ohio, Mr. Campbell received a B.S. degree in education with a major in mathematics and an M.S. degree in mathematics from the University of Delaware in 1958.

In December 1952 he joined the staff of the Ballistic Research Laboratories as a mathematician, with responsibility for preparing computer programs to solve critical problems related to national defense. For the past four years, he has supervised a group of exceptionally skilled computer programers working on unusually difficult scientific and engineering problems.

Other nominees for the "Federal Civil Servant of the Year" title who received certificates for their efforts were: Roland L. Simmons, Chief, Infantry Weapons Evaluation Branch, Ballistics Research Laboratories; Walter R. VanAntwerp, Chief, Solid State Physics Branch Army Nuclear Defense Laboratory, Edgewood Arsenal, Md.; John L. Reynolds, Chief, Operation Division, U.S. Army Engineer District, Baltimore; Miss M. Loyola Voelker, Chief, Medical Record Service, U.S. Public Health Hospital, Baltimore; and William G. Zaruba, Quarterman Shipfitter, U.S. Coast Guard Yard, Curtis Bay, Md.

"Civil Servant of the Year" Lloyd W. Campbell receives honorary certificate from Col Richard R. Entwhistle of the Ballistics Research Laboratories. Looking on is John Giese, Chief, Ballistics Research Computer Laboratory.

Emotional Behavior Problems Discussed at WRAIR Seminar

"Experimental Analysis of Emotional Behavior" was discussed at a recent staff seminar at the Walter Reed Army Institute of Research, Washington, D.C.

Lt Col Joseph V. Brady, Chief, Department of Experimental Psychology, Division of Neuropsychiatry, gave the principal presentation, focused on studies of conditioned behavior with laboratory animals. Experiments at WRAIR provide for analysis of emotional responses in relationship to anatomical, physiological and environmental factors.

Basic investigations have attempted to define the behavioral properties of such emotional states. Techniques of electroconvulsive shock, central nervous system ablation, and use of pharmacological agents have been used to explore relationships between fundamental biological processes and emotional behavior.

Recent studies suggest, Lt Col Brady said, the desirability of further application of this approach to analysis of psychomatic problems.

Defense Electronics Director Informs IRE Group Of DoD Efforts to Resolve Radio Frequency Woes

INFORMAL DISCUSSION at Institute of Radio Engineers meet is enjoyed by (left to right) Raymond Kendall, President, Boston Chapter, AFCEA; Frank K. Langstroth, President, Lexington-Concord Chapter, AFCEA; James M. Bridges, Director of Defense Electronics; James H. Davitt, Chairman, Boston Chapter, Professional Group on Military Electronics; William L. Roberts, Past Chairman, IRE Professional Group Communications System.

Future success in coping with radio frequency interference — a problem plaguing communications engineers for 40 years—depends "critically" on mutual military/industry understanding, in the opinion of James M. Bridges, Defense Electronics Director.

Speaking recently before the Boston Chapter of the Institute of Radio Engineers, he discussed action being taken throughout the Department of Defense to meet the problem.

"Growing concern over the increasing seriousness and magnitude of the problem throughout various quarters of the Department of Defense," he said, "led to an overall program for coordinated effort and acceleration of work in this area already being carried on by the Military Services."

Bridges credited the Army's Project Monmouth (see July 1961 edition, page 14) as "forcefully bringing to the attention of military management the seriousness of the rapidly advancing radio frequency interference problem.

"Reports such as Project Monmouth have warned us," he said "that we may be relying heavily on the operation of new weapons and communication systems that could be so degraded by mutual interference as to seriously degrade their effectiveness in full-scale military operation."

The U.S. Army Electronic Environmental Test Facility, Fort Huachuca, Ariz., also was credited with having revealed "serious interference situations."

With mutual radio frequency interference growing even more complex, and with the extension of the application of electromagnetic transmissions to many military devices other than radio, DoD saw fit to give it a new name, "Electromagnetic Compatibility (EMC)." Bridges termed it:

"The capability of electronic equipments or systems to be operated in their intended operational environment at designed levels of efficiency without unacceptable degradation due to unintentional interference."

The growing EMC complexity led, in July 1960, to the establishment by the Secretary of Defense of the Tri-Service Electromagnetic Compatibility Program, successor to the Radio Frequency Compatibility Program established a month earlier.

The DoD Program, and possible implications to the industry developing and producing military electronic equipments and systems that radiate or receive electromagnetic energy were discussed in the address, which listed these objectives:

- To determine quantitatively the amount of operational degradation resulting from mutual interference that might be encountered in currently envisioned operational situations employing military electronic gear.
- To develop improved frequency management methods and procedures.
- To establish information sources that will provide the developer of a new weapon or equipment with a complete definition of the electronic environment in which his weapon or system will be required to operate.
- To develop specifications, engineering methods and test procedures that will make it possible and feasible for the developer to design initially so that his equipment or system will operate compatibly with the other electronic devices in its operational environment.

EMC objectives have two major divisions, it was explained, one operational and the other research and development oriented.

The operational area includes the collection of spectrum signatures, assembly of an environmental file, development of propagation profiles and prediction of the electromagnetic interference situation that may exist in specified operational areas.

Concerning the R&D side of the program, cited activities include:

- Development of improved measurement techniques and test gear.
- A component development and improvement program.
- Development of engineering specifications and standard application to EMC.
- Development of simulation methods and equipment.
- An educational program to inform personnel at all levels of operations and management in both the military and industry of all aspects of EMC.

"In perhaps two or three years," Bridges said, "contracts for the development or production of defense communications-electronic equipments and systems that radiate or receive electromagnetic energy will include definitive specifications and requirements for electromagnetic compatibility not only within the specific equipment or system, but with respect to its operational environment."

The Electronics Industries Association has formally recommended to DoD that EMC be included as a "firm requirement in our R&D contracts," he added, and stressed these points:

- Development of EMC specifications and standards must be a joint Defense/industry activity.
- Care should be taken not to overspecify in one area or treat any specific area of specification unilaterally.
- Many people in the military services and in indusry, from management levels down, must be educated concerning all aspects of the electromagnetic compatibility problem — its nature, its importance to the national security, and the management, engineering and operational factors involved in its solution.

In conclusion, Bridges urged that industry and Defense management take the time to become fully acquainted with the EMC problem and its possible impact on military/industry relationships.

"If management acquired a clear understanding of the problems involved in the EMC Program," he said, "our ability to develop and introduce contractual and technical reforms that will gain our program objectives with minimum disturbance will surely be improved."

Picatinny Arsenal Proves 'Powder Keg' Perch Safe

Sitting on a powder keg is as safe a perch as one can find, as long as no one pushes the detonator — a fact dramatically demonstrated by more than 7,000 employees at Picatinny Arsenal, Dover, N.J.

One of the U.S. Army's leading research and engineering centers, Picatinny Arsenal is responsible for developing a wide range of dangerous products — propellants, explosives, ammunition rounds, and nuclear weapon components.

Statistics indicate that the ammunition handler at Picatinny is less likely to be injured than a worker in the communications industry, which has long held the lowest annual accident frequency rate.

Facts strongly indicate that the munitions handler is more susceptible to highway or home accidents than he is to accidents on the job.

In the nature and variety of activities, the ammunition and chemical industries have much in common. The similarity ends there, however, because the injury frequency rate for chemical workers is four times higher than for ammunition handlers.

These facts are supported by comparing statistics compiled by the National Safety Council for more than 30 Army ammunition facilities with industrial injury rates.

Maximum safety at Picatinny is achieved by recognizing potential hazard areas in working with explosives and by leaving nothing to chance. Accidents are prevented by careful planning and systematic elimination of hazards by safety engineers, supervisors and workmen. The arsenal boasts a relatively low accident rate and a long list of safety citations.

The Army's concern with the ammunition safety program starts at the research and development stage and continues through the point where the finished product may be dropped in the enemy's lap.

Army Announces Choice Of Sprint Subcontractor

Selection of Martin-Marietta Corp. as development contractor for the Sprint missile as a major component of the Nike X antimissile missile system was approved by the Department of the Army Mar. 18.

The Sprint missile is part of the redirected Nike Zeus program announced in January by Secretary of Defense Robert S. McNamara. He indicated that the Nike X would incorporate the Sprint and advanced radars and components of the current Zeus system.

The initial subcontract being negotiated between Bell Telephone Laboratories and Martin-Marietta Corp. is expected to be approximately $5 million. Western Electric Co. is the prime contractor.

The Sprint subcontractor was selected after an extensive review of more than 40 defense contractors by Bell Telephone Laboratories and the Army Nike Zeus Project Office at Redstone Arsenal, Ala.

Col I. O. Drewry, Nike Zeus project manager who is also directing Army efforts on the Nike X, said that Sprint will complement, not replace, the Nike Zeus missile. The Sprint will be shorter and lighter than the 48-foot-long Zeus and will use a solid-fuel propulsion system.

Emphasis in the Sprint design is on extreme acceleration characteristics to reach intercept altitude in less time than the Zeus which with its 450,000-pound thrust first-stage booster is the fastest air defense missile in the Free World.

Martin-Marietta will do the Sprint work at the Orlando, Fla., plant. Initial testing of the missile will be carried out at White Sands Missile Range, N. Mex., with subsequent firings planned at Kwajalein Island in the mid-Pacific.

'Bounce Pass' Solves Communications Problem

Army missilemen at Redstone Arsenal, Ala., have solved a communications problem with an old basketball technique—the bounce pass. A large aluminum sheet strategically placed on the roof of the Army Missile Command Headquarters plays a role in a complex data transmission system.

The device serves as a reflector used to "bounce" microwaved data transmitted from rocket test stands some five miles distant to the Army's new computation center across the street from Command Headquarters.

In the center, electronic computers digest the microwave data and provide test engineers the information they need almost as soon as the motor under test stops smoking.

"Reflecting microwaves is not an unusual technique," said Aubrey W. Presson, Deputy Chief, Instrumentation Branch, Test and Evaluation Laboratory, "but the circumstances which caused us to use the reflection technique are unusual."

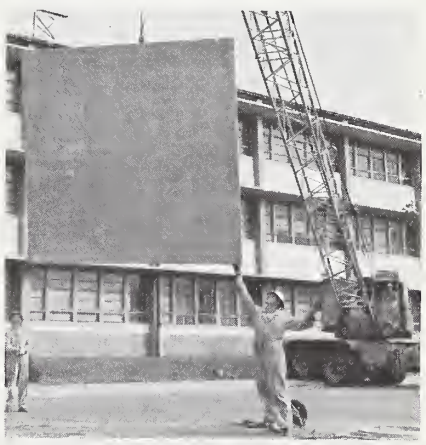
The problem developed when missile experts, who have a reputation for cutting corners, ran into one corner they could not trim. The troublesome corner was round—in the form of a large water storage tank on a hill several hundred yards south of the Command Headquarters.

Microwaves follow a straight line and the location of the computation center put the water tank directly in the line-of-sight path to the test area transmitters.

Previously, a time lapse of 6 to 12 hours was required before data was available to test engineers at the test site. The "quick-look" data transmission system now provides the information in 10 to 20 minutes.

Complete test data reduction and tabulation formerly was not available for three to six days. Required information is now ready for test engineers in three to six hours.

Immediate future plans for the system include a reverse data link from the computation center to the test area. This will make complete primary ballistic data available to the test site within five minutes after a captive test firing.



MICROWAVE REFLECTOR being lifted into place on top of Army Missile Command Headquarters, Redstone Arsenal, Ala., represents new link in data transmission system.

Army Employee Receives $1,500 for Packaging Method

Sanford I. Tennyson, U.S. Army Supply and Maintenance Command civilian employee with more than 36 years Government service, has received the Army Certificate of Commendation for "development of a new concept for preserving and packaging military materiel."

The award was presented by Lt Gen August Schomburg, Commanding General of the Supply and Maintenance Command, during recent ceremonies at Command Headquarters in Wash., D.C.

A monetary award of $1,500 was presented to Tennyson for adoption of the suggestion, expected to result in savings of more than $7 million over the next five years.

Already in operation, the new concept is the mass preservation of military material through controlled humidity as opposed to conventional preservation and packaging of individual items.

Sanford I. Tennyson receives Army Certificate of Commendation from Lt Gen August Schomburg, CG, Army Supply and Maintenance Command.

Preserving military materials by the controlled-humidity CONEX (Container Express) packaging method reduces time and costs for handling, marking and documenting shipments. In addition, it provides a prepacked container ready and suitable for rapid emergency shipment anywhere in the world.

The container has other advantages such as lower initial cost, storage facility, and simplified inspection and inventory of military materials. It also reduces the number of packages to be handled at all points involved.

A native of Alexandria, Va., Tennyson served 22 years with the Army Ordnance Corps before transferring to the U.S. Army Supply and Maintenance Command when it was activated on Aug. 1, 1962. He is now a traffic manager in the Materiel Movements Division, Directorate of Transportation and Installations.

During his long Federal career, he has received many awards and commendations, including the Army's Meritorious Civilian Service Award. Tennyson considers his outstanding achievement to be the design and implementation of the Government-wide civilian 26-pay-period system, which he recommended to Senator Byrd of Virginia in 1943 and which was later enacted into legislation.

APRO Scientist Reports on Image Interpretation

In military reconnaissance, to quote President Kennedy, "our best inspector is the camera," but techniques of evaluating aerial photography results are subject to continuing research.

Dr. Robert Sadacca, a U.S. Army Personnel Research Office scientist, discussed studies which are contributing to the effectiveness of aerial reconnaissance when he spoke at a recent Research Analysis Corporation seminar. His subject: "Human Factors Studies in Image Interpretation."

The image interpreter, he said, is the significant human factor link between the camera eye and the intelligence report which provides the commander with the basis of Go/No Go decisions.

As the leader of a USAPRO team which has been successful in developing methods of error reduction in image interpretation and reporting information more specifically, Dr. Sadacca said that "definitive answers to complex human problems of interpretation come slowly."

A computer program is being developed to utilize equations involving the constants of interpreter performance, quality of imagery viewed, number of interpreters agreeing on an identification, and the confidence level of the interpretation.

Such computer-digested information will help intelligence officers evaluate the output of individual interpreters as well as the output of the whole reconnaissance system.

Dr. Sadacca also spoke before the American Society of Photogrammetry in Washington on Mar. 25-28, regarding the research his team is doing. He suggested a clearance house for research in the image interpretation area and pointed out that the Photo Interpretation Committee of the Society could help member research activities by developing a central file of completed research and an imagery exchange service.

George Bigelow of USAPRO talked on "Photographic Interpretation Keys —A Reappraisal" at the ASP meeting. He believes that interpretation keys should be continually revised, incorporating comparative imagery from the new sensors.

ATMC Employees Get $40,000 For Performance, Suggestions

The Army Transportation Materiel Command, St. Louis, Mo., paid over $40,000 in sustained superior performance, suggestion, and special acts awards during 1962.

Brig Gen David B. Parker announced that superior performance awards totaling $30,500 went to 189 employees while 124 people received a total of $6,105 for suggestions. Twenty-five persons received special act awards totaling $3,950.

William C. Gallaway received the highest special act award of $500 and Frank Ronat topped the suggestion winners with $470.

News Story of Army Contract On Light Helicopters Denied

A news clipping appearing in the *Army News Digest*, Mar. 16, excerpted from a story published in the Mar. 9 edition of the *Los Angeles Times*, reported that the Army would purchase between 3,600 and 6,000 production models of the OH6-A, a light helicopter developed by the Hughes Tool Co.

This report is contrary to fact, according to the project manager of the Light Observation Helicopter project in the U.S. Army Materiel Command and the Office of the Chief of Research and Devolpment.

Development of prototypes of a new light helicopter has been assigned to three aircraft companies; Bell Helicopter Co. (OH4-A), Hiller Aircraft Corp. (OH5-A), and Hughes Tool Co. (OH6-A).

Intended primarily for observation and troop support operations, the 4-place aircraft will have to meet Army requirements in engine design, speed capability and other operational aspects. It will be a new concept in light helicopters since it will utilize a small turbine engine.

Officials stated that prototypes will be delivered by each of the companies for competitive evaluation starting early in 1964. Only after stringent testing will a selection be made and production models ordered.

200 Top Science Students Meet at Fort Monmouth

Nearly 200 top science students from 41 central and southern New Jersey high schools participated in the Mar. 23-24 Junior Science Symposium at Fort Monmouth, N.J. Joint sponsors were Monmouth College, West Long Branch, and the U.S. Army Electronics Research and Development Laboratory.

Maj Gen Stuart H. Hoff, commanding the U.S. Army Electronics Command, and Col James M. Kimbrough, Jr., commanding the Laboratory, addressed the group.

Guest speakers included Dr. Polykarp Kusch, Nobel Prize winner from Columbia University, whose topic was "Limitations of Science"; Dr. Frederick C. Kull, CIBA Pharmaceutical Co. who spoke on "Biology—Its Challenge to Youth," and Dr. Warren S. McCullough, Massachusetts Institute of Technology, who discussed "How Brains Work."

Dr. Harold A. Zahl, Director of Research at the Army Electronics Laboratory, told the students that their generation can aid in shaping "the most interesting and exciting 50 years in all human history.

"Barring our planet becoming a supernova due to human frailty, or misunderstanding, even Aladdin and his magic lamp would not be able to accomplish what will be within your potential as future leaders, be it in science or other fields."

Other highlights included tours of the Electronics R&D Laboratory, a laser presentation by Dr. Harold B. Jacobs of the Solid State and Frequency Control Division, a career guidance panel conducted by Dr. Hans K. Ziegler, Chief Scientist of the Electronics Command, and a teachers' seminar directed by Miss Ruth Guinon, Associate Professor of Teacher Education at Monmouth College.

High Pressure Researchers Confer on Material Changes

Forty of the Nation's experts in the field of high-pressure research met at Watervliet (N.Y.) Arsenal, Mar. 14-15, to discuss the effects of extreme pressure on the structure, properties and chemistry of materials.

Sponsored by the U.S. Army Research Office, the meeting was concerned primarily with the aspects of high pressure which may be instrumental in developing new materials not obtainable by temperature or composition variations alone.

High pressure has been successfully employed in the extrusion of metals and, most spectacularly, in the synthesization of diamonds for use in electronics. (See Diamonds in Production, April 1962 issue.)

"From Dust to Dust" was the title of a featured address by Dr. Curtis L. Hemenway, Director of the Dudley Observatory, Albany, N.Y. Fourteen technical papers included a discussion by Thomas E. Davidson, Chief of the Arsenal Physical and Mechanical Metallurgical Laboratory, describing the Arsenal's work on structural changes in metals by high pressure.

Arranged by Dr. Robert E. Weigle, Arsenal Chief Scientist, the meeting was attended by representatives of laboratories working on Army high pressure contracts, experts from industrial and academic organizations, and other Government agencies.

Fort Belvoir Enlisted Man Earns Officer Commission

Kenneth L. Anderson recently achieved the distinction of being the first enlisted man at the U.S. Army Mobility Command's Engineer Research and Development Laboratories, Fort Belvoir, Va., to receive a direct commission as an officer.

A 24-year-old native of Gettysburg, S. Dak., Anderson held the grade of E-4 (specialist) and was serving at the Laboratories under the Scientific and Engineering Program when commissioned on the basis of his education and his record since entering the Army in 1961. After basic training at Fort Leonard Wood, Mo., he was assigned to the Laboratories in February 1962. Now he will attend an 11-week Engineer Officer's Orientation Course at Fort Belvoir before returning to Fort Leonard Wood.

Lt Anderson attended the State School of Mines and Technology, Rapid City, S. Dak., where he obtained a B.S. degree in mechanical engineering in 1960.

Army Publishes Terms Dictionary

A newly published *Dictionary of United States Military Terms* (Public Affairs Press, $4.50) is a guide to the meaning of thousands of terms which have come into wide usage since the end of World War II. It was originally prepared under the direction of the Joint Chiefs of Staff expressly for the Defense Department and it is being made available to the public for the first time.

13 Army General Officers Receive New Assignments

Recent announcements by Secretary of the Army Cyrus R. Vance of assignments of Army general officers, effective prior to July, included:

Lt Gen James L. Richardson, Jr., Deputy Commander and Chief of Staff, U.S. Army, Pacific, assigned as Deputy Chief of Staff for Personnel, Washington, D.C.

Maj Gen Ray J. Laux, Chief, Army-Air Force Exchange Service, New York City, assigned to the Defense Supply Agency, Washington, D.C.

Maj Gen Robert A. Hewitt, Office of the Deputy Chief of Staff for Personnel, assigned as Commanding General, 5th Region, Army Air Defense Command, Fort Sheridan, Ill.

Maj Gen Richard D. Meyer, Deputy Chief of Staff for Logistics, U.S. Continental Army Command, Fort Monroe, Va., assigned to the Office, Joint Chiefs of Staff, Washington, D.C.

Brig Gen Travis T. Brown, Senior Logistics Adviser ROK Army, assigned to Headquarters, Continental Army Comand, Fort Monroe, Va.

Brig Gen John D. Cole, Director of Topography and Military Engineers, Office, Chief of Engineers, assigned to the Defense Intelligency Agency, Washington, D.C.

Brig Gen John W. Dobson, Assistant Commander Armor School, Fort Knox, Ky., assigned to Antilles Command, U.S. Army, Caribbean.

Brig Gen Welborn G. Dolvin, Headquarters, Allied Land Forces Central Europe, assigned to the Armor School, Fort Knox, Ky.

Brig Gen Andy A. Lipscomb, Chief of Staff, XVIII Airborne Corps, Fort Bragg, N.C., assigned to Headquarters, U.S. Army, Alaska, Fort Wainwright, Alaska.

Brig Gen Delk M. Oden, Director of Army Aviation, Office, Deputy Chief of Staff for Military Operations, Washington, D.C., assigned to the Military Assistance Advisory Group, Vietnam.

Brig Gen George E. Pickett, Signal Officer, Eighth U.S. Army, Korea, assigned to Office, Personnel Operations, Washington, D.C.

Brig Gen John J. Tolson, III, Chief Military Assistance Advisory Group, Ethiopia, assigned to the Office, Deputy Chief of Staff for Military Operations, Washington, D.C.

Brig Gen George H. Walker, Assistant Commandant, Army Engineer School, Fort Belvoir, Va., assigned to the Office, Chief of Engineers.

Cost Plus Incentive Fee Contract Let on Nike X

The contract covering test and development of the U.S. Army's Nike Zeus/Nike X antimissile missile system has been converted from a cost-plus-fixed-fee type to a cost-plus-incentive-fee type, the U.S. Army Missile Command, Redstone Arsenal, Ala., reports.

Under the terms of this type contract, the Government will pay the prime contractor, the Western Electric Co., incentive increases when performance exceeds established standards specified as targets, as determined by the Nike Zeus Project Office.

The standards apply to certain critical areas of the system development related to component performance and delivery schedules.

Failures to attain the negotiated standards are penalized by decreases in fees paid the contractor, just as increases in fees can result from exceeding the standards.

The amounts of the upward or downward changes in the Western Electric fee will depend upon the degree of success or failure as established by a reviewing body, with final approval delegated to Col I. O. Drewry, the Nike Zeus project manager. The incentive fee supplement went into effect Feb. 15 and will apply to plus or minus performance factors adjudged as of Sept. 30.

The Army project staff plans to evaluate needs for future contracts and incorporate incentive provisions where appropriate.

Western Electric Co. has signed an incentive fee contract with the Nike Zeus missile airframe contractor, Douglas Aircraft Co., and the Army project management is encouraging similar subcontract agreements.

Watertown Arsenal Applies Old Technique to New Need

A high-pressure intensifier technique initiated years ago at Watertown (Mass.) Arsenal to test recoil mechanisms in artillery weapons development is now being applied to metallurgical research tasks of the Army Materials Research Agency.

Proved practical through the unassociated field of artillery weapons development, the method can apply up to 200,000 pounds per square inch pressure as a tool in developing a powdered metallurgy process.

Team effort of Watertown Arsenal and AMRA in use of the high pressure system has proved that the utilization of past experience to solve new problems not only serves to accelerate research and development projects, but also shortens the "concept to hardware" cycle.

The Research and Development Division of Watertown Arsenal is working with Harold B. Wessenger, a veteran of 28 years of Government service, in developing the powdered metallurgy processing method.

Maryland Academy of Science Sponsors Army Scientist

A U.S. Limited War Laboratory physiologist was sponsored by the Maryland Academy of Science in making a series of lectures on meteorology in cities throughout the state.

Matthew J. Wargovich, assigned to the LWL Biological Research Branch at Aberdeen Proving Ground, Md., combines his knowledge of physiology and meteorology to help determine what the American soldier needs to fight in remote areas of the world.

In the seminar series he discussed the Tiros weather satellites, prediction of fallout from atomic explosions, Russia's interest in meteorology and the local weather phenomena. The lectures, given for secondary school and college teachers, emphasized the need for a knowledge of meteorology in their work.

For the past ten years Wargovich has been studying weather conditions in Harford County. On the basis of these studies he plans to write a book on weather and weather forecasting in the Chesapeake Bay area.

Army Authorizes Vietnam Patch

The Department of the Army has approved design for a shoulder patch to be worn by members of the Military Assistance Advisory Group who have served in Vietnam since July 1, 1958.

The shield is red, alluding to the infiltration and aggression from beyond the yellow Great Wall of China. The opening in the wall through which the infiltration and aggression are flowing is blocked by an upright white sword depicting offensive action. The entire patch is outlined with a yellow border.

MAAG personnel may wear the patch on the right shoulder after they return to the United States.

SCIENTIFIC CALENDAR

2nd Annual Conference on Automation and Personnel Administration, sponsored by the Society of Personnel Administration, Washington, D. C., Apr. 26.

Transient Radiation Effects on Electronics, sponsored by DASA, Bethesda, Md., Apr. 29-May 3.

1963 Conference of Society of Photographic Scientists and Engineers, sponsored by OCRD and DA, Atlantic City, Apr. 29-May 3.

6th Hypervelocity Impact Symposium, sponsored by BRL, USAF, NRL and USN, Cleveland, Apr. 30-May 2.

MORS Symposium on Limited War, sponsored by ONR, Annapolis, Md., Apr. 30-May 2.

2nd Congress on Hazards of Electromagnetic Radition to Ordnance, sponsored by the Bureau of Naval Weapons, Philadelphia, Apr. 30-May 2.

Dynamic Loads Probiems Associated with Helicopter and V/STOL Aircraft, Buffalo, spring or summer (date undetermined).

Conference on Recent Advances in Polymer Science and Technology, London, England, May 1-3.

International Society of Soil Mechanics and Foundation Engineering, Tokyo, Japan, May 1-4.

Space Lubrication Conference, sponsored by DoD, NASA, and the American Society of Lubrication Engineers, NYC, May 3.

11th Colloquium on Protides of the Biological Fluids, Bruges, Belgium, May 3-5.

9th Infrared Information Symposium, sponsored by ONR, Dallas, Tex., May 3-8.

Pan Pacific Symposium Aerospace Medicine, Honolulu, Hawaii, May 5-8.

3rd International Conference on Atmospheric and Space Electricity, Montreux, Switzerland, May 6-10.

3rd International Materials Handling Conference, Brighton, England, May 8-10.

1st International Symposium on Histochemistry, Warsaw, Poland, May 13-16.

5th International Symposium on Condensation Nuclei, Clermont-Ferrand and Toulouse, France, May 13-18.

7th Navy Science Symposium, Pensacola, Fla., May 14-16.

11th Annual Conference on Mass Spectroscopy, sponsored by the American Society for Testing and Materials, San Francisco, May 14-19.

Colloquim on Topics in Plant Biochemistry, Leiden, Netherlands, May 16-17.

1963 International Symposium on Humidity and Moisture, sponsored by NBS and the American Meteorological Society, Washington, D. C., May 20-23.

International Symposium on the Relation of Properties to Structure, Melbourne, Australia, May 20-24.

1th Annual Power Sources Conference Atlantic City, May 21-23.

Lunar Surface Materials Conference, Boston, May 21-23.

6th International Mineral Processing Congress, Cannes, France, May 26-June 1.

International Conference ou the Operating Experience and Future Development of Power Reactors and Radioisotopes, Montreal, Canada, May 27-29.

17th Annual Frequency Control Symposium, Atlantic City, May 27-29.

Antarctic Treaty, Meeting of Experts on Antarctic Communications, Washington, D. C., May (date undetermined).

International Conference on the Sub-Celluiar Radiobiology, San Francisco, May (date undetermined).

8th Nuclear Congress, NYC (date undetermined).

International Union of Testing and Research Laboratories for Materials and Structures, Palermo, Italy, May, June or Sept. (date undetermined).

2nd Conference on Tropical Meteorology, Asbury Park, N. J. (date undetermined).

DDRE Memorandum Stresses Objectives Of Research, Engineering Management

Procedures to advance technical and managerial aspects of the Nation's defense research and engineering program are discussed in a new guidance memorandum issued by Dr. Harold F. Brown, Director, Defense Research and Engineering.

Titled "Management of Research and Engineering," the memorandum calls for a "better understanding" of the program structure among the Assistant Secretaries of the Army, Navy and Air Force for Research and Development.

"Many projects in the Engineering and Operational Systems Development categories," the document states, "are not receiving proper management attention and do not enjoy control under management concepts that appear most desirable."

Provisions pertaining to improved performance, reduction of "lead time," and cost objectives of the defense program, include:

NATURE OF PROJECTS. A project submitted for approval and inclusion in either the Engineering Development or Operational System Development categories of the RDT&E program should be one for which required engineering data have been previously accumulated in exploratory and advanced development work.

Budget recommendations and other management actions are based in part of this criterion.

The accomplishment of a project should involve primarily engineering activity as contrasted with the more experimental efforts carried on in earlier stages of the research-to-production sequence.

The state of advancement of the project should generally be such that engineering effort alone is required to:

- Meet and demonstrate the specific performance and interface characteristics of the item or system desired.
- Assure reliability, producibility and maintainability.
- Provide for minimum production, deployment and maintenance costs.

APPROVAL. Differing natures of projects are such that they may be approved for full development without reservation or approved with fund releases limited to those necessary for the conduct of a Program Definition phase normally not exceeding six months. The purpose of Program Definition is to provide:

- Firm and well-documented mutual understanding between the contractors and Government as to realistic specifications.
- Firm (and reasonably detailed) cost estimates.
- A plan for the execution of the program so phased and directed as to provide the necessary emphasis on the pacing and maximum risk items.
- A concept of project organization and set of systematic procedures which will assure success (performance-cost-time) of the program.

MANAGEMENT. Each Engineering or Operation System Development project shall have designated a project manager (either a Government civilian employee or military officer).

In discussing management techniques, Dr. Brown tells the Services to use their judgment in determining the magnitude and types of projects to which the use of PERT/COST (Program Evaluation Review Technique) should be applied in research and engineering efforts. Sufficient evidence exists from the applications of this technique, he states, to demand its employment in major Engineering and Operational System Development projects.

Dr. Brown's memorandum refers to DoD Instruction 3200.6 on Reporting of Research and Development and Engineering Program Information. This instruction is the basis of the newly published AR 705-25 concerning Research and Development of Materiel. (See Volume 4, Number 1, page 1.)

WRAIR Lab Develops System For Physiological Variables

The Psychosomatic Laboratory of the Walter Reed Army Institute of Research (WRAIR), Washington, D.C., has developed a data processing system for physiological variables in which time interval and amplitude measurements are being studied.

Measurements are displayed in digital form for "on line" readout and stored in appropriate format for subsequent computer processing.

Currently being tested by the system are parameters for the electrocardiogram, ballistocardiogram, subject temperature, tissue optical density, blood pressure and a variable proportional to the rate and depth of breathing.

The system can be adapted to a wide variety of other electrical signals measured either directly or by the appropriate transducer system.

By Ralph G. H. Siu

PETREIUS AND POMPEY. In the campaign to strengthen our in-house laboratory competence, the question arises as to the relative importance of an able laboratory director as compared to able bench researchers. This recalls one of Niccolo Machiavelli's Discourses:

"Whether an able commander with a feeble army, or a good army with an incompetent commander, is most to be relied upon."

According to Caesar, neither one is worth much. He worried little about his Spanish campaign against Afranius and Petreius because he "was marching against an army without a chief." Nor was he particularly concerned in Thessaly against Pompey since he "was marching against a leader without an army."

With regard to "whether it is easier for a good captain to form a good army, or for a good army to form a good captain," Machiavelli concluded "the matter is about even." He pointed out however, that "a good army without an able commander often becomes insolent and dangerous, as was the case with the Macedonian Army after the death of Alexander, and with the veteran troops in the civil wars of Rome. And, therefore, I am disposed to believe that you can more safely rely upon a competent general, who has the time to instruct his men and the facilities for arming them, than upon an insolent army with a chief tumultously chosen by them.

Those generals, therefore, deserve double praise and glory who not only had to conquer but had actually to form and train their troops before meeting the enemy. For in this, they have shown that twofold merit the union of which is so rare that many commanders, if they had been obliged to perform the same task, would not have obtained that celebrity which they have achieved."

STUPIDITY AND THE GODS. The savant Johann Wolfgang von Goethe once said:

Against stupidity, the Gods themselves struggle in vain.

Development Program Aimed at Broad Use of Gas Turbines

By James H. Horton
Chief, Engine Branch, U.S. Army Engineer R&D Laboratories

The dynamic impact of the gas turbine engine in the military and commercial aircraft field since World War II is widely known. The thousands of gas turbines which propel today's aircraft and their excellent record of reliability attest to their success, and their promise for future military requirements.

The past decade has brought an ever increasing interest in the gas turbine for other applications in the industrial, automotive, and marine fields. Gas turbines are being used, either experimentally or in limited production quantities, in a wide variety of power applications, from large central power plants to small hand started portable engines.

On the military side, advancements in the electronic and missile fields and new concepts of mobility in the Army are creating demands for lightweight compact power sources that cannot be met by reciprocating engines. The most promising prime mover for many of these applications is the gas turbine.

The major advantages of the gas turbine are:

- Light weight and small size.
- Smooth operation and minimum vibration due to the absence of reciprocating parts.
- Relative insensitivity to fuel type and quality.
- Basic simplicity and small number of parts.
- Simplified ignition and lubrication systems.
- Self-cooling feature.
- Good cold starting characteristics.
- Clean exhaust due to high air-fuel ratio and combustion efficiency.
- Flexibility in being able to provide compressor bleed air and large quantities of exhaust heat (for heating, air conditioning, or other uses) in combination with shaft power where necessary.

The gas turbine is not without problems which have prevented or delayed general use in military ground power applications. Foremost are high initial cost and high fuel consumption, plus high noise level, vulnerability to dust ingestion, and susceptibility of "hot-end" components to lead corrosion and lead deposition when operating with combat gasoline.

In spite of these shortcomings, the gas turbine is continually finding new uses in applications where no other type of prime mover can compete on a size and weight basis nor match the gas turbine's versatility and quick starting capability.

Because of the excellent potential of gas turbines in ground power equipment for the Army, programs have been established at the U.S. Army Mobility Command's Engineer Research and Development Laboratories, Fort Belvoir, Va., to advance the development of industrial type turbines, with particular emphasis on their application to electrical power generation equipment.

Concurrent with the application of commercially available gas turbine engines to the interim family of generator sets in the 15 to 150 kw. range, research and development programs have been initiated to provide a family of advanced turbines ranging from approximately 20 to 1,500 hp.

The advanced units will be designed to power high-speed, high-frequency generators in appropriate sizes (taking advantage of the high rotational speed of the gas turbine) and will also be suitable, with minor modifications, for powering other end items such as high speed pumps, compressors and mobile type construction equipment. Present plans entail a family of six basic engine sizes to cover the desired range.

The primary objective of the advanced development program is to improve greatly the thermal efficiency and reliability of gas turbines. They should compete successfully with reciprocating engines in these respects and, at the same time, offer the major advantages of small size, lightness and versatility for military applications.

Along with these improvements, the problem of high cost is expected to diminish greatly from its present level as production is increased. Development time and cost will be minimized to the extent practicable by taking advantage of the latest technological advances in industry and utilizing existing or improved components whenever possible.

The 200/300 hp. gas turbine, currently under development by the U.S. Army Engineer Research and Development Laboratories and AiResearch Manufacturing Co., offers an excellent example of the advances in small gas turbines being achieved through Government-supported research and development. It features good fuel economy, low maintenance, high reliability and good durability. The basic engine is of relatively simple design, consisting of a 2-stage centrifugal compressor, single-can combustor and 3-stage axial turbine.

For low cost and ease of manufacture, the three turbine wheels are machined from identical precision castings and differ in blade height only. Wheels and the compressor impellers are individually balanced before assembly on the shaft. Any of these components can be replaced in the field without completely rebalancing the rotor assembly.

Wheel containment is provided by sizing the stator outer ring thickness so that a maximum energy burst of any of the wheel discs, or the total burst energy of all three stages of rotor blades, can be absorbed (a rarely needed but nevertheless desirable safety feature). The rotor assembly is supported on two antifraction type bearings. The combustor is designed for easy accessibility, and removal of the flame tube can be accomplished by one man without special tools in 15 minutes.

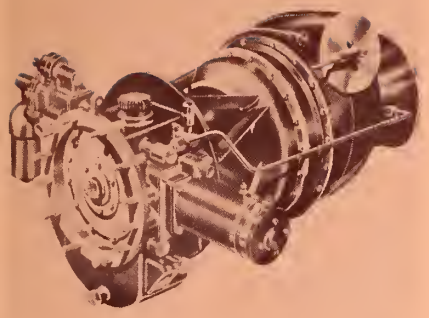
The output pad and accessory arrangement are designed for ultra-high-speed direct-drive electrical generators, but can accommodate a reduction gear for driving conventional slower speed equipment.

The engine has capability of burning all military fuels, including JP–4, JP–5, CIE and No. 2 diesel fuel, combat gasoline and aviation gasoline. The design permits adaptation of a stationary, tube-type recuperator for applications in which low fuel consumption is of paramount importance and the added weight and bulk of the recuperator can be tolerated.

The engine is being developed in two basic horsepower ratings, 200 hp. and 300 hp., with only minor design differences between the two versions. The target weight and fuel consumption figures for both the simple cycle and recuperative engines of each rating are shown in Table 1.

Performance data used here are based on standard ambient conditions of sea level and 60°F. The engines have ample power reserve to maintain their continuous rated output at 8,000 ft. elevation and 90° F. These target figures are considered quite realistic and show that, on a net horsepower basis, fuel economy approaches that of reciprocating internal combustion engines (the 300 hp. recuperated version even approaching some modern diesels).

On the basis of horsepower per pound of engine weight, the gas tur-



300 h.p. advanced gas turbine engine.

Table 1. Target weights and fuel consumption for 200 and 300 h.p. gas turbine engines

Type	Weight (lb.)	Continuous rated performance		Max. output performance	
		B.hp.	S.fc.	B.hp.	S.fc.
300 hp. (unrecuperated)	200	300	0.663	530	0.595
300 hp. (recuperated)	550	300	0.450	518	0.444
200 hp. (unrecuperated)	200	200	0.690	315	0.601
200 hp. (recuperated)	450	200	0.500	310	0.470

bine, even in the recuperative version, has a decided advantage over the reciprocating engine.

Concurrent with the development of the family of advanced gas turbine engines, a new program of supporting research seeks solutions to the operating and accessory problems incident to various military applications of these units. Results will be incorporated into the turbine family program as it progresses. The following is a brief resumé of the principal problem areas and what we are doing in these areas.

Governing of regenerative type turbines. This problem relates to the effect of regenerator heat storage on response characteristics of turbines during sudden load changes. An analytical investigation is under way to define the extent of the problem, following which an experimental program will be undertaken to evaluate and prove out the necessary control system techniques.

Dust ingestion. Tests of selected small gas turbines, under actual and simulated field environments, have shown that under even mild dust conditions (e.g. particle sizes of less than 10 microns in concentration as low as .001 gram/cu. ft.) severe damage can occur in aerodynamic flow passages in a relatively short time unless the engines are adequately protected with effective air filtration. Development of new types of air filters will meet this problem.

Noise. Everyone who has been in close proximity with an operating gas turbine is aware of the high noise level. The sound can be attenuated to a large degree by enclosing the engine in a silencer housing and using lined inlet ducts and exhaust duct extensions. This type of acoustical treatment adds considerable weight and bulk to the engine. A better method, if it can be devised, is to quiet the turbine internally. This approach is currently being investigated and preliminary analysis indicates some promise of internal silencing through careful optimization of materials and structres.

Operation on Combat Gasoline. Some military applications of gas turbines require operation on combat gasoline with tetraethyl lead content up to 3 cc. per gallon. This usually results in lead deposits forming in turbine nozzles and blades, robbing power from the engine. Under certain temperature conditions, lead compounds corrosively attack the hot parts of the engine.

Considerable effort has been expended in developing solutions to these problems and, although they are not completely solved, much progress has been made.

A relatively simple technique has been developed for cleaning deposits from turbines in the field. Known as "Carbo-blast" treatment, it involves the introduction of a mild abrasive, such as crushed apricot pits, through the combustor into the hot parts of the engine for a short period of time. Considerable knowledge has been gained through laboratory component tests of high-temperature materials and coatings resistant to corrosion.

Accessories. Problems on gas turbine accessories relate principally to the need for high-speed accessories (fuel pumps, governors, oil pumps, etc.) which will operate with a minimum of reduction gearing, and to the need for simpler, lower-cost fuel controls and lightweight starting systems. Work is under way or planned in these areas.

Advances of great magnitude can reasonably be expected in small gas turbines, possibly within the next five years, if sufficient effort in research and development is applied. Based on recent experimental work with blade cooling in large aircraft-type turbines and anticipated advances in high-temperature materials, it is now possible to contemplate future development of small engines which will operate with turbine inlet temperatures of 2500° F. or even higher.

Development of high-pressure-ratio, high-efficiency compressors, improved turbine aerodynamics and heat exchangers should combine to make possible radical improvements in thermal efficiency and improved power output. Engines with 40 percent thermal efficiency (.34 lb/bhp-hr specific fuel consumption) in sizes down to 600 horsepower and less appear feasible with advanced component research.

In summary, the gas turbine is generally regarded as having the best long-range potential of any mechanical prime mover in existence. We have only scratched the surface in exploting its potential. With properly supported research, we can look forward to major technological advances within the next few years that will enable gas turbines to replace reciprocating engines in many military uses.

Simple Converter Ordered For Nuclear Power Plants

A simplified power conversion system for mobile nuclear power plants is being fabricated for delivery in August 1964 as part of the development of compact reactors in the AEC-U.S. Army Nuclear Power Program.

The gas turbine-compressor will be a single-shaft machine with a single-stage centrifugal compressor and a 2-stage axial turbine operated on nitrogen gas-lubricated bearings.

Designed for a net power output of 630 horsepower and a lifetime of 50,000 hours, the unit will weigh less than 1,500 pounds.

One of the biggest advantages of the closed-cycle unit will be elimination of lubricating oil contamination of the reactor system. Bearings will be externally pressurized from the compressor during normal operation, with an auxiliary source to supply gas during startup, shutdown and emergencies.

The unit is being designed, fabricated and tested by Clark Bros. Co., Olean, N.Y., under a $556,122 contract.

The system will be proof tested at the Advanced Power Conversion Experimental Facility of the Army Nuclear Power Program at Fort Belvoir.

Army Support Added to NSF-I Through R&D Training Units

U.S. Army suport of junior science activities in high schools is being extended to the "grass roots" level in 35 states preliminary to the 14th annual National Science Fair-International at Albuquerque, N. Mex., May 6-10.

Army Reserve Research and Development Training Units in each state are delegated responsibilities for support of junior science fairs at the area and regional level by instructions issued Feb. 20, 1963, by the Office of the Chief of Research and Development.

Most of the more than 2,100 members of USAR R&D Training Units are employed by industry, universities and other private research and development enterprises as skilled scientists, engineers and technicians.

When results of Army support of the National Science Fair-International (NSF-I) in 1961 and 1962 satisfied top Army leaders that expansion of effort was merited, planners turned to the USAR R&D Training Units as being ideally constituted to provide judges, career guidance information and other services at high school science fairs in area and regional competition.

Under the program of support as approved by the Chief of Research and Development, Army certificates of achievement may be awarded to selected winners in the "grass roots" level competitions. USAR R&D Unit commanders, or their designated representatives, are authorized to sign and award the certificates on behalf of the Department of the Army.

A stipulation of the program is that the junior science fairs must be conducted in association with Science Service, the nonprofit organization which has developed a vast complex of activities leading to the NSF-I.

Science Service is controlled by trustees representative of top level scientific agencies. Activities currently extend to more than 25,000 junior science clubs in the United States and foreign countries, including over 200 fairs preliminary to the NSF-I.

Army certificates of achievement, signed by Watson Davis, Director of Science Service, and Director of Army Research Maj Gen C. W. Clark, may be awarded for outstanding exhibits at regional junior science fairs in the following fields: guided missiles and rockets; biological medical research; basic research; electronics; mathematics; transportation devices; computers; biological foods.

Presentation of certificates, however, is not limited to those fields, some of which may not have entries in local junior science fairs. Awards may be made for any exhibits which, in the opinion of the Army representatives, are of interest to the Army. Moreover, the opinion of other judges and advisers may provide the basis of award of an Army certificate.

Further, the plan provides that certificates may be made available to civilian officials for presentation in behalf of the Army at science fairs in areas where USAR R&D Units are not readily available for assistance. In such areas officials may request certificates directly from the U.S. Army Research Office, Department of the Army, Washington 25, D.C.

Similarly, in regional junior science fairs conducted in association with Science Service where Army elements other than the R&D Reserves have provided strong support, Army certificates of achievement may be obtained on request.

Active Army elements have, in numerous instances, provided more extensive support than is basic to the USAR R&D support plan—such as financing trips for winners to industrial laboratories and various scientific institutions.

The purpose of the certificates, it was explained, is to give recognition to deserving science students and to attest to the Army's desire to encourage them in pursuit of careers in science—hopefully with the Army or in other Government service.

Members of USAR R&D Units may, under conditions set forth in the Feb. 20 letter of instructions, receive retirement point credits for participation in junior science fairs associated with Science Service. Participation may involve judging, planning, lecturing, demonstrating, counseling and other activities preliminary to each fair.

For the third consecutive year, a panel of Army judges composed of top-ranking scientists will select 16 (possibly more) of the top contestants in the NSF-I for a one-week all-expense-paid visit to Army laboratories of their choice. Each will receive a Certificate of Achievement signed by Army Chief of Research and Development Lt Gen Dwight E. Beach.

Plans also are being developed to provide a limited number of summer vacation jobs for winners in Army laboratories, where they will have the opportunity of working on research projects under the supervision and counseling of Army scientists.

Brig Gen Goshorn Visits Redstone

Brig Gen J. A. Goshorn, Deputy Director, U.S. Army Materiel Command Procurement and Production Directorate, recently visited Redstone Arsenal to present field procurement organization plans for comments.

Brig Gen H. P. Persons, Jr., commanding the Army Missile Command, greeted the visitor, who was accompanied by Col Clyde C. Zeigler, Col R. G. DeVecchio and Col M. G. Hatch, all of the Army Materiel Command in Washington, D.C.